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I. *On the general character, and principal sources of variation, in the Weather at any part of a Cyclone or Anticyclone.* By the Honourable RALPH ABERCROMBY, F.M.S.

[Received October 2nd.—Read November 21st, 1877.]

BEFORE entering on the principal subject of this Paper, it will be desirable to say a few words on the two methods that have to be combined to obtain a complete idea of Cyclone or Anticyclone Weather.

The first, or synoptic method, consists in drawing an isobaric map, and marking on it the position of rain, clouds, &c., by which their position relatively to each other, and to the cyclone or anticyclone centres, can be ascertained ; in fact in making a plan of the weather. Though in a general way an area of rain, surrounded by a ring of cloud, is found in the centre of a cyclone (fig. 1), and an area of fine weather about the centre of an anticyclone, still if the attempt is made to define the shape and position of these areas accurately, great discrepancies will be found. Sometimes the rainy area of a cyclone will be exclusively to the SE front of the centre; at other times it extends far in rear, as well as in front of the centre, and sometimes rain is only found at some distance on one side of the centre, where the sky is bright and broken.

The second method consists in recording the sequence of phenomena which occur to a single observer, as a cyclone or anticyclone passes over him—in fact, of drawing a section of the weather across a cyclone along a line parallel to the direction of its path. When this is done it is found that the mere words rain, cloud, &c., such as alone can well be marked on a synoptic map, convey but a very imperfect idea of their character and sur-

roundings, as the kind of rain and kind of cloud vary much in different parts of a cyclone, and are readily distinguished. Also, that the passage of similar parts of different cyclones over an observer does not bring exactly the same weather; for in one cyclone the sky may be merely overcast, while in another there is heavy rain; and in one anticyclone there will be thick wet fog, while in another dry winds and blue sky will prevail.

These two methods, the plan and section as it were, are so different that it is difficult practically to combine them, and to realise how a difference in a cyclone, on a synoptic map, will affect the sequence of weather as it passes over an observer. The object of the following paper is to define generally the nature and sphere of the principal sources of variation in the weather at each part of any cyclone or anticyclone, and to show how, in spite of endless diversities, certain broad characteristics of each are always maintained. Though the illustrations and details will refer almost exclusively to the weather of Great Britain, the general principles laid down appear to be of universal application in every part of the world.

The first source of variation in any cyclone or anticyclone, to which I would call attention, depends on the *type of general distribution of pressure, to which either belongs.*

The commonest type of cyclone in this country has the highest pressure some point south of the centre, on which side steep gradients are found, while on the north side the gradients are very slight. In this case the rain and cloud area extends far to the south and south-east of the centre, but comparatively little to the north and north-west, while the hardest weather generally is found to the point of south, where the steepest gradients are. In another less common type the highest pressure is some point to the north-east of the centre, on which side the steepest gradients are found, while to the south and south-west the gradients are slight; in this case the rain and cloud area is very differently shaped from that just described, extending furthest from the centre in the north-east direction, and less in the south or west, while the hardest or most severe weather is found to the point of north-east, where the steepest gradients are.

It may be well to mention here that it is very rare to find rain at any particular hour over the whole of what is called the "rain area;" but where not actually raining, the sky is overcast and bordering on rain, which is sure to fall some time during the day. Similarly in the area of less cloud, called the "cloud ring," isolated patches of rain are often found developed by local or other circumstances.

If, also, we consider the position of strongest wind, or the direction of the wind relative to the isobars, or the distribution of temperature relative to the centre, we find that certain general features, common to every cyclone, undergo considerable modification, according to the type of pressure distribution to which it belongs. The former of those two types, particularly mentioned above, may conveniently be called the *westerly*, and the latter the *north-easterly type* of cyclone.

In anticyclones the influence of type is much less marked than in cyclones.

The next source of variation is the difference of what may aptly be called the *intensity* of any cyclone. In cyclones of the same type the weather differs much in "hardness" or "severity," or in "quietness." Thus, in the south-east front the sky may be simply soft and overcast in a cyclone of moderate intensity, but with increased intensity the overcast sky would develope into soft, drizzling rain, or into broken rain, or even into a peculiar class of thunderstorm common on our west coasts in winter; but in spite of all these variations there is always the close muggy atmosphere, and dirty sky characteristic of this part of a cyclone. Again, in the rear, the general character is always a cool, brisk feeling in the air, with a bright and broken sky, which varies according to the intensity, from simply heavy masses of cloud, to hard showers, to squalls, or to hail squalls, with thunder and lightning; but no difference of intensity can ever alter the fundamental difference in the general character of the SE front and the rear portions of a cyclone.

It is well known that a deepening cyclone is increasing in intensity, while one which is filling up is decreasing, and Prof. Loomis has shown that in the United States rain and cloud extend further from the centre in the former than in the latter case, and I have reason to believe the same rule holds good in this country, though it is hard to verify. In anticyclones, the term intensity is much less applicable to their characteristic weather than in cyclones.

The term *intensity* has been applied by the Rev. W. C. Ley to the difference of weather due to the difference in steepness of gradients, and though that is one, and perhaps the principal, source of variation in intensity, the term is capable of considerable extension of meaning. Short lived cyclones, forming and disappearing rapidly, or a great development of secondaries, in which gradients are usually slight, though the weather, so far as rain and thunder are concerned, is very severe, are atmospheric conditions to which the term intensity is equally applicable.

Another source of variation depends on the size and shape of any cyclone, and is intimately connected both with the type and intensity.

It might obviously be expected that the weather in any part of a large cyclone, as, for instance, one of those which sometimes entirely cover the Atlantic Ocean, would be very different from the weather in a small cyclone, which, perhaps, only just covered the British Islands; and this is fully borne out by observation. In very large cyclones, the steepest gradients, and the bad weather which accompanies them, are always found at some distance from the centre. Round the centre itself, when the gradients are very slack, the sky is usually broken with hardish clouds, and there is a cold pleasant feeling of the air. In small cyclones the heaviest rain usually surrounds the centre, and extends more or less to one side or the other, according to the direction of the nearest area of high pressure and the steepest gradients.

Another source of variation in the size and extent of a cyclone rain and cloud area, has been pointed out by Professor Loomis. His examination of the United States weather charts points to the conclusion that the rain and cloud area is extended further in front of cyclones that are moving rapidly than

those moving slowly, but Mr. R. H. Scott has pointed out that it is difficult to trace this over an area so intersected by sea and land as the British Islands.

Another great source of variation is a class of phenomena which have as yet no recognised name, but to which the term *diurnal variation* seems very applicable. To a single observer, the broadest feature of the diurnal variation of the weather in a cyclone is, that starting from early morning, the amount of cloud and the general severity of the weather and rain gradually increase till about 2 p.m., and then gradually decrease till nightfall. Occasionally, however, a type of cyclone occurs, in which the rain comes on during the night, and takes off or ceases during the day. This is undoubtedly due to some far distant general causes, affecting the origin of the cyclone, but the few cases I have been able to trace are not sufficient to form any opinion on the subject; a diurnal variation of the weather is, however, sufficiently well marked, though it is to a certain extent abnormal.*

In anticyclones the diurnal variation presents a marked contrast to that in cyclones. In them, a misty or cloudy morning is followed by a great diminution of cloud as the day goes on, while later on, in the evening, mist and cloud are sometimes again formed.

If, besides these broad features of diurnal variation, we consider some of its more minute changes, we observe that, in cyclones, a cloudy morning often has a short break about 10 a.m.; that the weather then becomes much worse, but has a marked tendency to break again about 4 p.m. In anticyclones, a clear morning at 4 a.m. is frequently very cloudy at 10 a.m., after which the cloud again decreases till about 4 p.m., when more cloud or mist are often again formed, and last till quite late in the evening. The increase of cloud during the day in cyclones may be generally described as an increase of intensity; the decrease of cloud in anticyclones is not so easily explained, unless it is due to the increased intensity of the descending current found in them; but the minor changes at 4 a.m., 10 a.m. and 4 p.m. are obviously connected with the diurnal variation of the barometer, and their attentive study may perhaps some day throw light on that puzzling phenomenon.

But whatever modification the diurnal variation may make on a cyclone or anticyclone, the general character of either is never lost. No diurnal variation can make the clouds, and look of weather in the front of a cyclone like the clouds in the rear, or like the clouds formed from rising mist in an anticyclone, the variation being, as it were, a modifying influence super-imposed on a more general effect; but in some cases, where the general character is not very strongly marked, the diurnal variation becomes an important feature in a day's weather. Hence if we take the case of a stationary cyclone, and lay down on a synoptic chart the weather at any part of it, the extent of the cloud and rain areas will extend much further from the centre at 2 p.m. than at 8 a.m., and in an anticyclone much cloud will be found near the centre at 10 a.m.,

* Diurnal variation is also much influenced by the type of pressure distribution. With NW winds and pressure high to the W of Great Britain, cloudy days often culminate with a squall or shower about 4 p.m., and then subside to quiet nights.

but very little at 2 p.m.* Some diurnal variation of the weather seems to take place in every part of the world, as for instance, the daily thunder storms which occur in some parts of the tropics. The details above given must not be considered as applying to the whole temperate zone, but to the British Isles only; at Philadelphia, for instance, the greatest frequency of rain seems to be at 6 p.m.

Another very important cause of modification in weather is *local variation*. It is well known that in any storm, the position of showers, squalls, and thunder storms is very local, and at some places, either from the contour of the ground or other causes, they are much more frequently developed than at others; so also with the amount of rainfall, the position of ridges of hills relatively to the prevailing direction of the wind, or the presence of lakes and forests as compared with bare ground, or the position of the sea relatively to the prevailing wind, all seem to have an important influence in regulating its amount. So important is the position of the sea, that on our east coasts the worst weather is with East winds, while on our south and west coasts it is worst with West winds.

In anticyclones, and under any conditions where easy gradients do not give any very general marked character to the weather, the local variation is much more important than in cyclones, where the general character is much more strongly marked. Local variation is found in every part of the world; and in the tropical and equatorial regions, where barometric gradients are usually slight, it becomes a most important element of weather.

The last source of modification I would notice is the *seasonal variation*. In this country, during winter, the cyclones are usually much larger than in summer; and, even in cyclones of about the same size and intensity, the position of the rain and cloud areas is not quite the same. In winter time, the clouds and general appearance of the sky are usually softer than in summer, and the rain is more drizzly and less showery, besides many other smaller differences, which are too well known to require minute description.

All the above-mentioned variations relate to the position and extent of the rain and cloud areas, as seen on synoptic charts, but we shall now describe the general phenomena which appear to a single observer, as different parts of a cyclone pass over him, by which we acquire the knowledge of other important facts not to be deduced from synoptic maps.

In a British cyclone of ordinary size, the rain area and cloud ring are divided into three very well defined portions, which differ much in general character, viz. the north-east front, the south-east front, and the west or rear side. The front is divided from the rear by a line drawn through the centre of the cyclone, in front of which the barometer is falling, while in rear it is rising. The passage of this line over an observer, especially its southern half, is marked

* Since writing the above I have been enabled, through the kindness of Mr. F. Galton, to examine a considerable number of United States tri-daily synoptic maps. In some of them the difference of cloud and wind in the same disturbance, at different hours of the day, is very well marked.

by a very sudden and striking change in the appearance and feeling of the weather; the north-east and south-east fronts, though they have much in common, are sufficiently different to be classified separately, and are divided by the line drawn through the front, which represents the path of the cyclone; but this line does not mark the position of any great physical change, as the weather in either front merges gradually into the other.

In the north-east front, when the steepest gradients are somewhere south of the centre, the first symptoms of its approach are a gradual darkening of the sky, till it becomes quite overcast, with very little appearance of the formation of true cloud; or else, light wisps or barred stripes of cirrus moving sideways appear in the blue sky, and gradually soften into an uniform black sky; nearer the centre, light, ill-defined showers fall from the uniformly black sky, the wind from some point between South-east and North-east blows uneasily, and though the air is cold and chilly, there is an oppressive feel about it. These appearances continue till the barometer commences to rise, when the character of the weather at once begins to alter. In a cyclone where the steepest gradients are somewhere to the north and east of the centre, the general character of the weather is the same as above described, but is much more intense, the wind rising at times to a heavy gale and the ill-defined showers developing into violent squalls.

In the south-east front, when the steepest gradients are to some point south of the centre, the first symptoms are likewise a gradual darkening of the sky into the well-known pale or watery sky, with a muggy oppressive air; or else, as in the north-east front, wisps of cirrus first appear in the blue sky, which gradually become heavier and softer, till the sky is uniformly overcast. Nearer the centre, rain, usually in the form of a drizzle, sets in, and the wind, from some point between South-east and South-west, varying in force according to the steepness of the gradients, drives the cloud and rain before it. But this wind differs from that in the other portions of the cyclone, in its way of blowing; and, for the same velocity, does not raise so high a sea, or seem to bear so much down on the surface of the earth. In cases of very great intensity, the rain in this portion of a cyclone may come in showers, or even squalls, but the general character is never lost. These characters last till the barometer begins to rise. A line drawn from the centre of a cyclone in that southerly direction along which the barometer turns to rise, marks out the position of one of the most striking parts of a cyclone. Viewed on a synoptic chart, a small secondary cyclone is often found in some part of it, or else a curious V shaped depression, which frequently extends to the south of the centre. It would be a point of very great importance to determine accurately how far the line along which the barometer turns to rise, is at right angles to the direction of the path of the cyclone. As far as my own researches have gone, it seems to be often at right angles to that motion; but frequently it stretches nearly due south of the centre, even when the cyclone is going well to the north of east. It is sometimes very difficult to draw this line accurately owing to the frequent changes in the depth of any cyclone. As any portion of this line passes an observer, an immediate change comes over the whole

appearance of the weather, and the transition is often accompanied either by a very heavy shower, a squall, or hail, with a small irregular fluctuation of the barometer.

The general character of the west, or rear side, which now passes over the observer, is a cool exhilarating feeling in the air, with a high hard sky, of which the tendency is always to break into firm detached masses of cloud. The rain which occurs near the centre is usually in cold, sharp, brisk showers, or hard squalls, and the general hard look of the weather presents a marked contrast to the dirty appearance of the weather which characterises the whole front of a cyclone. As the centre recedes from the observer, showers or squalls are replaced by simply detached masses of cloud, and these finally disappear, leaving a blue sky. The wind, from some point between West and North, blows gustily, and for the same velocity raises a higher sea than a South-west wind, and seems to bear down more on the surface of the water. The whole of the rear of a cyclone partakes of this general character, but the change of weather along the line drawn north of the centre, along which the barometer turns to rise, is not nearly so strongly marked as along the southern line.

In one of the few cases I have been able to observe of weather on the north side of a cyclone going west, the North-west wind, in what was then the front, was dull and oppressive, but when the wind veered to North-east the sky broke to cumulus, and the air felt fresh. This seems to suggest the important conclusion, that the specific characters of the front and rear are due to some property of cyclone motion and not to the direction of the wind.

In secondary cyclones, as viewed on a synoptic chart, the area of rain and cloud sometimes appears to cover the area of shallow gradients inside the secondary; at other times, the rain especially seems confined to the partial ring of steeper gradients which surrounds the secondary on the side of the nearest area of high pressure. The most striking difference between a secondary and primary cyclone, is the great amount of rain and cloud with absence of wind developed in the former, compared with the less rain and cloud but the greater wind developed in the latter. To a single observer, the characteristic features of a secondary are a uniformly overcast sky, with a peculiar stagnant motion of the clouds, and a very gloomy appearance and oppressive state of atmosphere. When the rain comes on, it is usually very heavy, and falls straight, and in its general appearance and surroundings is very different from the driving, drizzling rain, so characteristic of the front of a primary cyclone. Another very marked difference between the rain in a primary and secondary cyclone, is in the motion of the barometer. In a primary, the misty rain in front is accompanied by a rapidly falling barometer, while the hard rain in rear is accompanied by a rising barometer; but in a secondary the barometer is usually perfectly steady, with a slight but quick motion at the beginning and end of the rain, either up or down, according to the general direction of barometric change. This heavy rain and cloud, with a steady barometer, was long a very puzzling phenomenon; and it is only since the publication of the carefully drawn charts of the Meteorological Office that its true nature has been discoverable.

In anticyclones, viewed on a synoptic chart, the position of blue sky, cloud, or fog seems very capricious, but to a single observer a certain general character is readily perceptible; but as it is much less marked than that in cyclones, it is more easily marked by diurnal, local and seasonal variations. In a general way, the weather is fine, or at least quiet; and though, in the calm centre especially, thick fogs are often found, and cloud in other parts, the surroundings are so different, that they can rarely be mistaken for cyclone weather. There is always a certain coolness in the air, though if the sun shines it is very hot; in fact, the terms "radiation weather," and "radiation temperature," would generally best describe anti-cyclone weather. There is no doubt that in this country rain sometimes falls in an anti-cyclone, and in France it seems to be tolerably common. To a single observer, the rain is usually in slight showers, with rather a high sky, and the general appearance is different from that in either primary or secondary cyclones; the showers are very often accompanied by a slight irregular motion of the barometer, and as they are very short and of small extent, are probably due to some local disturbance.

The following are illustrations of the general principles above mentioned. In fig. 1, I have given, in a diagramatic form, an almost exact representation

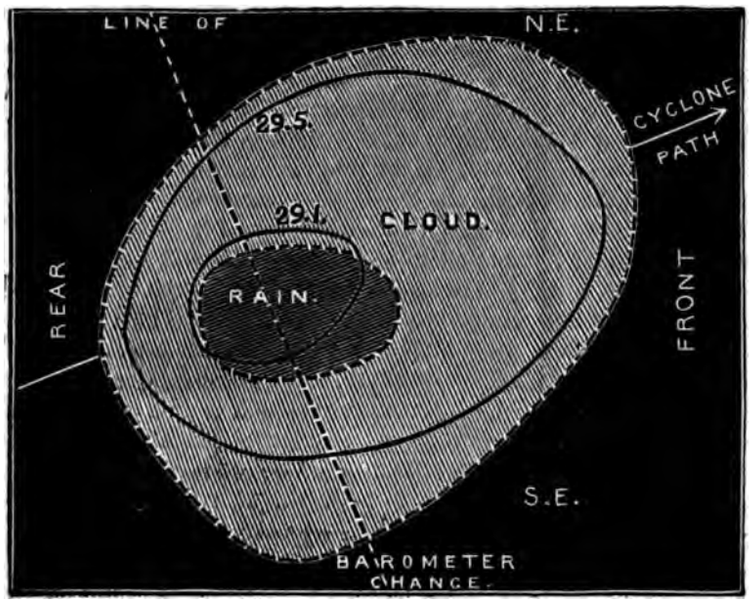

FIG. 1.
Diagram of typical Cyclone Weather, Nov. 14th, 1875.

of the rain area and cloud ring in a cyclone of great intensity, whose centre was over Liverpool, November 14th, 1875, at 8 a.m. In the synoptic chart for that date (fig. 2), the difference of the cloud ring in front and rear of the

line of barometer-change is strikingly marked, almost all the observations in front being marked *o* or overcast, and in rear *c* or detached clouds.

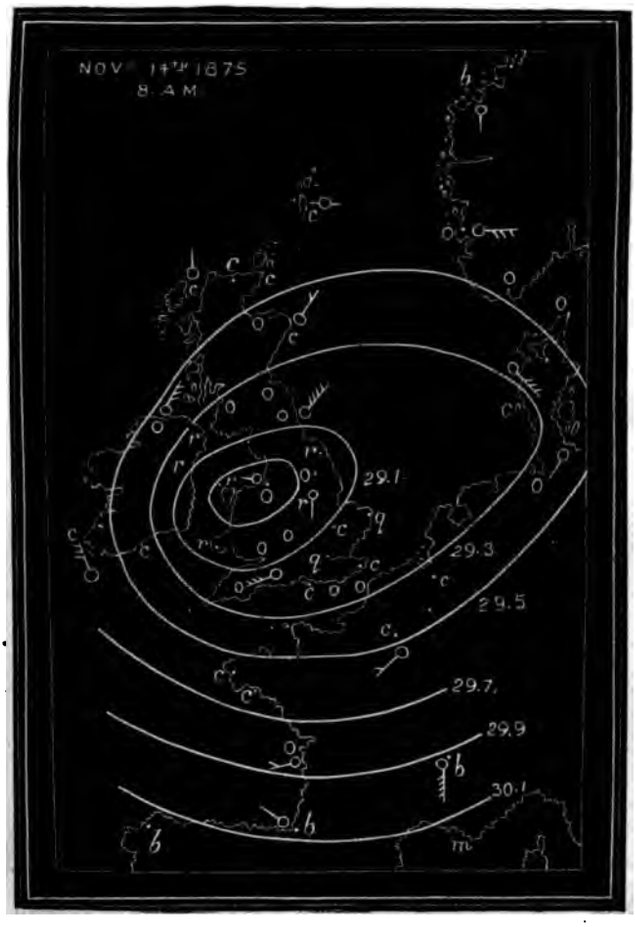

FIG. 2.

The next illustration is characteristic of one of our commonest winter types of weather, in which a fragment of a great cyclone touches Great Britain, and if the gradients are steep, gives locally very severe weather at a distance from the centre, where the weather is more moderate. In fig. 3 are given the isobarics and weather for February 26th, 1874, at 8 a.m. On that morning the centre of a cyclone, so large as to fill nearly the whole of the North Atlantic, lay about 600 miles to the north-west of Ireland, having advanced from the north-west; the pressure over a large area in the centre, which partially extended over the west of Ireland, was very uniform, and a ring of steep gradients extended over all Great Britain except the extreme east. At

Valencia, which is within the central area of slack gradients, the amount of cloud was only 4 with passing showers, and at Yarmouth, outside the steep gradients, the amount of detached cloud was 5 on the usual scale;* but at

FIG. 3.

every British station between these two points, where the ring of steep gradients is found, there is rain or an almost overcast sky, with very heavy wind. By next morning the cyclone had recoiled in a north-west direction, and the weather improved, while the wind shifted a little more to the west of south. In London, the principal feature of the weather was almost continuous rain for twenty-four hours, from 6 a.m. on the 26th, the rain being a little broken the early part of the night. The whole day the air was warm and damp, and the barometer fell quickly and continuously. In

* In the diagram the weather at Yarmouth is erroneously marked *q* instead of *c*.

the thermogram at Kew, the weather is reflected in a very smooth trace, and a uniformly small difference between the dry and wet bulbs. Valentia, during the whole of the 26th, was within the central area of slack gradients, and the broken sky is reflected in the zigzag trace of its thermogram.

The next illustration is characteristic of one of our commonest types of north-east weather. In fig. 4 are given the isobars and weather for February 26th, 1875, at 8 a.m., and being for the same day of the year as the last illustration, the effect of any seasonal variation is eliminated, and the whole difference of weather is due to difference of pressure type. The centre of the fragment of a cyclone which covers Great Britain is over the Bay of Biscay, and has moved in a south-west direction since the previous day, and somewhat enlarged in area; the gradients in the centre are very slight, and the steepest are to the north-east over Great Britain. Looking at the weather symbols, we see that the intensity of the cyclone is so slight that there is

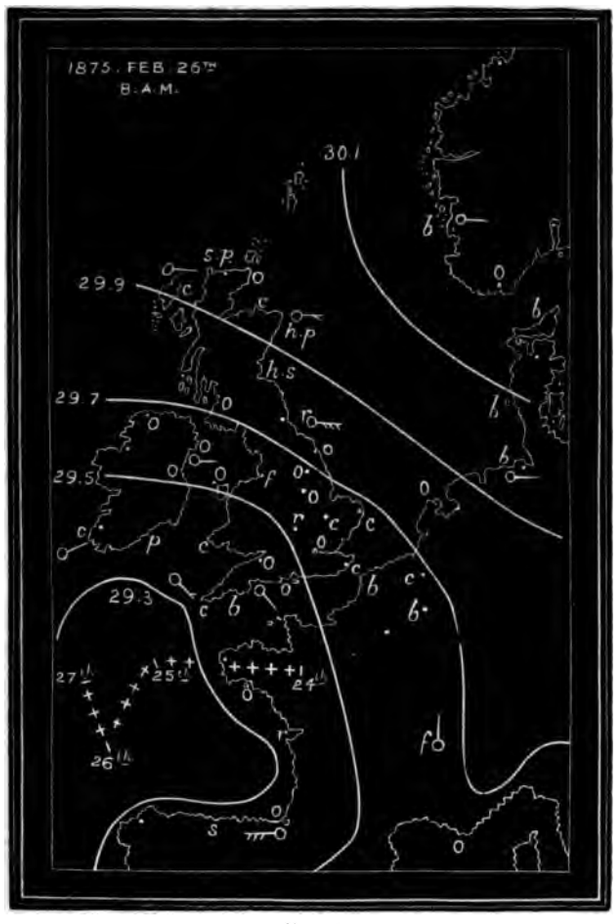

Fig. 4.

nothing approaching a continuous rain area anywhere, but a generally overcast area stretches from the centre furthest in a north-east direction, while here and there spots of rain are developed. In our own islands the rain is almost exclusively on the coasts exposed to the East wind, while on our west coasts the sky is only overcast or broken.

The above illustrations demonstrate principally the variations of weather due to the conditions of pressure, and the local variations of exposed coasts.

Diurnal variation is best illustrated by the observations of a single day. On the 31st of May, 1875, the centre of an anticyclone covering England lay over Ireland; by the next morning the centre of the same anticyclone, still covering England, was over the German Ocean. At Upper Norwood, at 4.30 a.m. on the 31st, the sky was quite clear, with a little mist in the Beckenham Valley. By 7 a.m. heavy clouds had gathered, but the valley was clear from mist. The clouds continued all the morning, but gradually cleared to a bright afternoon and cloudless night; the horizon was always clear and the air cool. At 4.30 a.m. on the next day the sky was almost cloudless, but by 9 a.m. some rather heavy clouds had gathered, and the same diurnal variation was repeated, so that if a synoptic chart had been constructed for 10 a.m., cloud would equally have been marked in this anticyclone which might have been marked at the rear side of a cyclone, but the sequence and surroundings were so different that a single observer could hardly have mistaken the one for the other.

The results of this paper may be summarised as follows: —

In a cyclone, the broadest feature of the weather, as seen on a synoptic chart, is an area of rain about the centre, surrounded by a ring of cloud, beyond which the sky is clear. The precise form and position of these areas vary with the type of pressure distribution, with the intensity of the cyclone, and with the rate of its progress; they are also influenced by local, diurnal and seasonal variations, the general sphere of each of which is indicated.

By recording the appearance to a single observer of any part of a cyclone, as it passes over him, it is discovered that the area of rain and cloud-ring may be divided into two portions by a line drawn through the centre, in front of which the barometer is falling, and in rear of which it is rising, the front and rear differing in physical appearance and general character of the weather. Details are given, and it is shown that this character remains constant, whatever changes the variations above-mentioned may effect.

In anticyclones, synoptic charts show great irregularity in the positions of cloud, &c., owing to local, diurnal and other variations; but to a single observer, who considers the surroundings and physical appearance, a certain general character can be discovered in every part.

A marked contrast is shown to exist between the diurnal variation of the weather in a cyclone or anticyclone, and a probable connection is pointed out between the diurnal variation of the weather and the diurnal variation of the barometer.

[The following are additional illustrations of the term *intensity* as applied to weather. Take the cyclone shown in fig. 1, and conceive another of the

same size and shape, moving in the same direction at the same rate, but in which the isobars, instead of representing a difference of $\frac{3}{10}$th inch, represented a difference of only $\frac{1}{10}$th inch, then we should have two cyclones differing in nothing except "intensity," which would be greater in the first than in the second. The corresponding difference of weather would be shown in a less continuous area of rain near the centre, in a smaller extension of cloud round the rain, and in a less total rainfall all over the country during the cyclone's passage. Where squalls occurred in the first cyclone, they would be replaced in the second by brisk showers, and the weather generally would be more deficient in those properties to which the words "hardness" or "severity" are usually applied, but the general character and position of the front and rear would remain unaltered. Thus we see that this kind of "intensity" depends on the steepness of the gradients in a single cyclone.

The other kind of "intensity" refers rather to that sequence or tract of weather to which the term "broken" would be applied. From synoptic charts "broken" weather is found to be either the product of small, quick-moving cyclones, which only exist a very short time, or of frequent secondaries; in contradistinction to the weather produced by large, shallow-gradient cyclones, moving slowly and lasting some days, which would be associated with more settled weather.

The difference between these two kinds of intensity is analogous to single heavy gusts of wind, being as much a sign of great atmospheric disturbance as numerous short puffs, although they proceed from different causes.

With regard to the line dividing the front and rear of a cyclone, it can always be approximately determined by drawing a series of sections of pressure, across the cyclone, parallel to its path. The line along which each of these sections changes from rise to fall is the line required, and is obviously independent of the deepening or filling up of the cyclone. Sometimes when a cyclone is filling up very quickly, the barometer rises even when the central line is approaching the observer; and conversely, when a cyclone is deepening rapidly, the barometer continues to fall after the central line has passed, but the relation of wind and weather relative to the cyclone centre always remains the same. In this fact we have the explanation of many seeming anomalies between the apparent motion of the barometer and the actual state of the weather.—R. A., *March*, 1878.]

DISCUSSION.

Mr. JINMAN stated that he was disposed to consider the phenomena alluded to by the author to be more simply explained by his own theory of storms, stated in his work, 'Winds and their Courses,' published in 1860, than by the circular theory of cyclones and anticyclones.

CAPTAIN TOYNBEE said that Mr. Jinman's remarks did not apply to this Paper, as it was based on *facts* and not on *theory*; for instance, no theory could change the direction of the isobars and winds on the diagrams. He wished that Mr. Abercromby had given the cases on which his remarks were based, stating that there were *diurnal* influences on the wind and weather of cyclones, as he thought it would be very difficult to separate such influences from those of the position of the observing station in relation to that of the centre of the

cyclone. He thought it would be well in future to consider these cyclonic winds in connection with the ridges of high pressure which lay between them, as in many cases he noticed that cyclonic winds were formed, as it were, in the hollows of waves of pressure, in which cases the ridges travelled with the cyclones, and formed, as it were, part of them. In many cases the ridges, with their corresponding winds, extended over many more degrees of latitude than the cyclones themselves; in fact, they, with intervening hollows, frequently passed over us, causing winds veering from S to NW which were not cyclones at all. He considered the paper an excellent one, and hoped that such useful work would be continued.

Mr. SCOTT agreed with Captain Toynbee's last remark, and said that the science of weather would be greatly advanced if such an energetic and capable observer as Mr. Abercromby would work out the subject of periodical diurnal changes of weather, such as the reason of the weather changing at fixed hours, nine a.m., noon, or three p.m., &c., or the truth of the saying, "wet before seven, fine before eleven." He would also be glad to hear Mr. Abercromby's explanation of the relation between the rapid clearing of the sky at night, and the immediate succession of a storm, of which an admirable instance had occurred on the preceding night. He would only advert to the old French proverb :—

"Temps qui se fait beau la nuit, dure peu quand le jour luit."

Mr. GASTER regretted that he had been unable to hear more than the summary of this paper, owing to his official duties having detained him at the Meteorological Office that evening. He felt, however, that Mr. Abercromby was taking really valuable steps when he attempted to classify the phenomena noticed in the neighbourhood of cyclones and anticyclones. In many people's minds the facts here spoken of floated about in an ill-defined manner, and probably would continue to do so for the want of time to discuss and group them properly. With reference to the remarks of Mr. Jinman, he felt bound to say, that the theory he propounded would not account for the facts observed, and this was proved conclusively by the conditions of weather prevailing over the United Kingdom that very evening. The position of the British Islands is such as to render the obtaining of direct information from a few hundred miles to the westward of us hopeless; and in consequence of this it is necessary, in order to improve our storm warnings, that we should discover what are the general conditions under which depressions appear in our neighbourhood. This must be done by the careful consideration of the distribution of and changes in pressure, temperature, &c., hundreds of miles further afield than we can do at present.

Mr. SYMONS said that he had had certain hazy, ill-defined impressions respecting the weather in the different quadrants of a cyclone, but in this paper he found them clearly expressed. Although he had nothing to do with the issuing of storm warnings (and he was glad he had not, as it was a very onerous and somewhat thankless duty), yet he might perhaps express the thought that if either an observer like Mr. Abercromby could be stationed at Valencia, who would throw his whole mind into the matter, and not only give the readings of the barometer, thermometer, &c., but his own impressions of the coming weather, and like information was supplied from the other observers on the west of Ireland, not restricted to a certain number of words, but able to "speak" through the telegraph, the central office in London would be in a better position to issue warnings than it is at present; or the predictive duties of the Office might be discharged from an Irish sub-office.

Mr. STRACHAN said that the paper would have gained in importance if more definiteness of statement had been employed. Some limitation should have been given of the phenomena termed "cyclone," "anticyclone," &c. The expression "intensity of weather" was not very intelligible, and referring to the front of a cyclone as the portion where the barometer is falling, and the rear that in which it is rising, is only correct with respect to the pressure at the centre, and the passage of a storm over a given track, as it must sooner or later be filling up.

The Hon. RALPH ABERCROMBY regretted that he was not acquainted with Mr. Jinman's theory of opposite currents, though it appeared to him to be a modification of the old theory of parallel currents. The diagrams illustrating his paper were from actual observations, and it would be for the Fellows to judge for themselves how far the facts there shown could be explained by opposing currents. In reply to Captain Toynbee, he observed that in very many cyclones there is

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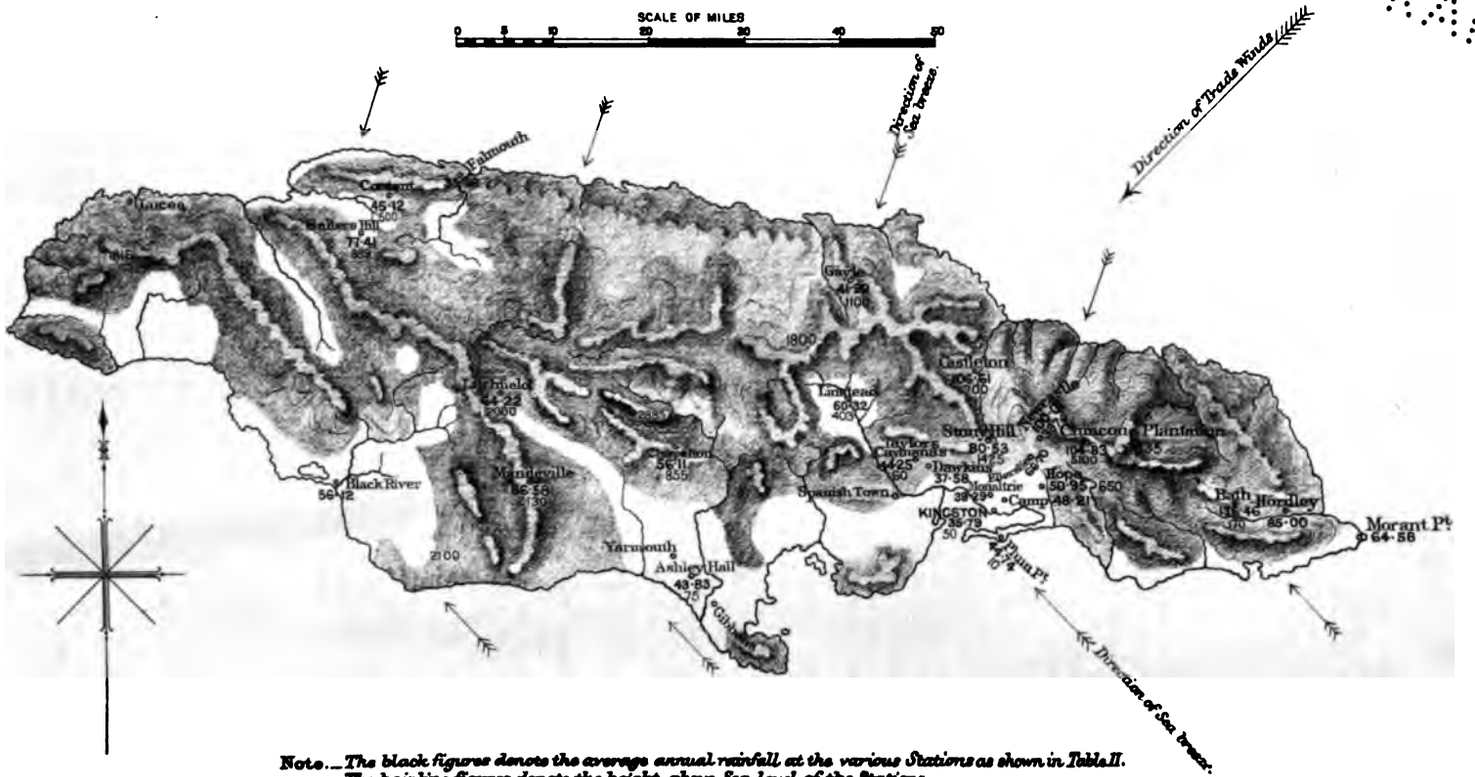
JAMAICA

DIAGRAM SHEWING MOUNTAINS, HILLS, PLAINS AND RIVER SYSTEM.



Note.—The black figures denote the average annual rainfall at the various Stations as shown in Table II.
The hair-line figures denote the height above Sea-level of the Stations.

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often a short break about 10 a.m., and a very considerable increase of rain and cloud about 2 p.m., at almost any direction or distance from the centre; and the interpretation he had proposed to put on these observations is, that there is a diurnal variation over riding the general cyclonic character. With regard to those depressions where the isobars take a sharp V shaped form with a ridge of high pressure in front, it is certainly important to observe that they are not cyclonic, and very desirable to work out their relation to cyclones. The scope of the Paper did not include any form of isobarics except cyclones and anticyclones. Had it done so, the same general principle would have been shown to hold with reference to these ridges of pressure, namely, that every portion has a characteristic weather and appearance. In reply to Mr. Scott, he had made many observations on the fact of weather changing at fixed hours, as 9 a.m., noon, or 3 p.m., but he had not been able to explain them further than that they belong to the general class of diurnal variations which modify but do not alter the general barometric character of the weather. As to the truth of the saying, "wet before 7, fine before 11," the few observations he had on the subject were almost all connected with small secondary fluctuations, and point to the conclusion that in certain types of pressure distribution there is a tendency to form these secondaries in the early part of the day; but the subject is still very obscure. The complement to this saying, "rain at 8, fair late," he had only observed in cyclones, and believed the explanation to be the diurnal increase of rain and cloud described in the Paper. The rapid clearing of the sky at night, with rain or storm next day, is due to the passage over an observer of one of those wedge-shaped ridges of pressure, which often precede cyclones. If the eastern side of the ridge where the sky is always clear and bright happens to be over an observer in the early part of the night, it is almost certain that by next morning he will be exposed to the rain of the cyclone on its western side. The French proverb, he only knew from books, and not from observation. In reply to Mr. Symons, though it would be very desirable that observers should telegraph details of the weather, as well as instrumental readings, he doubted whether any advantage would be gained by transferring the Central Office from London to Ireland. If every part of a cyclone has a characteristic appearance, all that any prognostic does is to enable an observer to recognise his place in the general circulation of the atmosphere. In reply to Mr. Strachan—by "cyclone" is meant that roughly circular configuration of isobarics round a depression, and by "anticyclone" that roughly circular configuration of isobarics round an area of high pressure, specimens of which are found on every large synoptic chart. The expression "intensity of weather" is fully explained in the Paper and the note appended to it. With regard to the line dividing the front and rear of a cyclone, it can always be proximately determined by drawing a series of sections of pressure across a cyclone parallel to its path. The line along which each of these sections changes from rise to fall is the line required, and is obviously independent of the deepening or filling up of the cyclone. Sometimes, when a cyclone is filling up very quickly, the barometer rises even while the central line is approaching the observer; and conversely, when a cyclone is deepening rapidly, the barometer continues to fall after the central line has passed, but the relation of wind and weather relative to the cyclone centre always remains the same.

II. *On the Rainfall of Jamaica during the seven years* 1870-1876. By Griffith N. Cox. A Letter to Charles Greaves, F.G.S. (Plate 1.)

[Received May 22nd.—Read June 20th, 1877.]

April 17th, 1877.

I have at length received the papers, &c., with reference to the rainfall in Jamaica; and I now forward them, together with a diagram of the Island, showing its mountain and river system, and also two tables of averages that I have worked up. I am sorry that the materials should be so scanty, and

TABLE I.

Mean Monthly Rainfall at the undermentioned Stations in Jamaica during the Seven Years, 1870-1876.

Station.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Kingston—	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Director of Roads Office	1·64	·69	1·17	·83	3·76	1·33	2·47	4·38	5·16	8·84	4·14	2·07
Plumb Point } Upper Gauge*	1·26	·59	1·36	·69	3·99	1·75	2·92	3·20	5·36	7·73	4·08	1·86
Lighthouse } Lower Gauge*	·87	·50	·66	·83	3·60	1·32	2·16	3·96	4·60	7·87	3·69	1·80
St. Andrew—												
Stony Hill	4·65	1·72	2·78	4·80	9·61	4·50	4·69	11·59	9·53	13·31	9·27	4·40
Up Park Camp	1·89	·54	1·23	1·31	4·34	1·60	2·46	4·72	5·68	11·63	4·93	3·72
Newcastle	6·33	2·43	3·47	6·63	7·98	5·20	5·84	7·55	13·33	19·06	11·20	7·01
Hope	3·26	·65	1·46	1·75	4·34	1·65	2·87	8·06	8·25	7·50	4·91	2·07
Cinchona Plantation	12·07	2·52	4·00	8·87	7·31	4·49	5·09	5·46	15·52	22·23	13·04	7·10
Monaltrie	1·79	·58	1·21	1·28	3·25	1·38	2·85	5·12	6·20	11·51	4·14	1·98
St. Thomas—												
Morant Point Lighthouse*..	5·19	1·43	1·89	2·49	8·96	3·80	2·97	3·95	8·51	11·76	9·27	6·21
St. Catherine—												
Dawkin's Caymanas Estate..	1·85	1·56	2·04	2·07	4·22	1·09	1·10	3·92	7·61	7·11	3·53	1·59
Taylor's ,, ..	1·98	1·43	1·57	2·80	5·49	1·90	2·39	4·87	8·49	7·70	4·33	1·61
Clarendon—												
Chapelton	2·71	1·96	2·39	2·53	8·04	2·31	2·71	6·61	7·24	11·85	4·31	2·69
Ashley Hall	1·85	1·30	2·34	1·86	6·10	1·57	1·44	5·14	8·06	8·24	4·63	1·13
Manchester—												
Mandeville*	2·80	1·50	4·72	4·25	13·71	4·64	6·90	9·09	10·06	18·87	6·90	4·63
St. Elizabeth—												
Black River	1·69	1·95	2·49	2·88	8·06	2·93	4·26	8·18	4·27	10·08	5·73	3·56
St. James—												
Salter's Hill	4·80	1·73	3·01	3·60	13·10	7·38	5·95	9·44	7·31	11·71	4·23	7·21
St. Mary—												
Castleton	13·99	2·56	4·45	6·10	14·42	5·09	7·41	8·84	8·36	9·23	12·66	7·69

TABLE II.

Annual Rainfall at the undermentioned Stations in Jamaica during the Seven Years, 1870-1876.

Station.	Altitude of Station.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	Mean Annual Rainfall.
Kingston—	Ft.	In.	In.	In.	In.	In.	In.	In.	In.
Director of Roads Office	50	51·79	..	17·64	37·99	42·07	24·48	40·81	35·79
Plumb Point } Upper Gauge *	60	78·63	23·61	17·23	47·67	43·44	23·95	38·54	39·01
Lighthouse } Lower Gauge *	10	50·37	18·39	8·99	40·91	45·59	26·40	42·53	44·74
St. Andrew—									
Ellerslie	2000	81·04	52·37	..	..	..	..	..	66·70
Halfway Tree	300	57·63	32·52	..	..	..	..	..	45·07
Stony Hill	1425	107·76	63·59	67·39	80·53	83·09	..	..	80·53
Up Park Camp	220	59·22	..	..	43·19	..	39·03	51·09	48·13
Newcastle	3974	135·92	..	66·32	..	..	73·60	124·20	100·01
Hope	650	..	..	..	57·06	51·30	31·12	64·34	50·95
Cinchona Plantation	5100	..	82·83	..	..	106·10	104·77	125·63	104·83
Monaltrie	250	..	..	23·63	42·63	48·71	35·66	45·82	39·29
St. Thomas—									
Morant Point Lighthouse* ..	..	92·63	53·28	51·47	63·88	84·76	35·85	70·21	64·58
Bath	170	149·64	123·28	..	..	..	..	..	136·46
St. Catherine—									
Dawkin's Caymanas Estate ..	60	52·30	26·62	24·36	46·84	.	..	..	37·58
Taylor's ,, ..	60	..	36·18	29·61	52·83	56·46	36·56	53·85	44·25
Linstead	403	..	..	..	60·25	60·40	..	..	60·32
Clarendon—									
Chapelton	..	61·78	43·67	48·35	65·03	61·72	..	..	56·11
Ashley Hall	75	..	32·60	27·08	43·17	71·49	44·84	..	43·83
Manchester—									
Mandeville*	2130	154·91	63·23	61·93	87·95	68·55	54·84	114·68	86·58
Cedar Grove	..	..	169·83	80·62	..	..	129·75	..	126·73
St. Elizabeth—									
Black River	..	71·11	48·17	55·75	57·26	48·34	..	..	56·12
Trelawney—									
Falmouth	..	45·94	25·43	..	..	..	...	..	35·68
St. James—									
Salter's Hill	889	..	..	63·02	77·37	91·05	75·98	79·66	77·41
Content	500	...	..	..	..	..	46·85	43·39	45·12
St. Mary—									
Castleton	700	..	64·69 (?)	73·56	..	129·82	..	117·06	106·61

The Stations marked thus * *have furnished records for the entire Seven Years.*

TABLE III.

Monthly Record of Rainfall at the undermentioned Stations in Jamaica for the Year 1870.

Stations.	Jan.	Feb.	Mar.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	Total.
Kingston—	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Director of Roads Office	1·62	·815	·75	0· 32	9·895	0·73	2· 86	5·77	1·015	17·82	7·14	3·06	51·795
Plumb Point Lighthouse (Upper Gauge	..	..	..	0· 20	13· 67	1·38	8· 95	2·50	3· 16	36·55	6·16	6·06	78· 63
Plumb Point Lighthouse (Lower Gauge	..	..	..	0· 92	10· 43	0·85	4· 52	2·16	2· 13	17·18	6·43	5·73	50· 37
St. Andrew—													
Ellerslie	..	..		2·735	11· 36	2·36	4·725	7·42	5· 84	25·86	14·25	6·49	81· 04
Halfway Tree	..	..	1·32	1· 69	9· 92	0·79	3· 58	3·24	3· 96	19·70	8·10	5·33	57· 63
Stony Hill	..	..	..	7· 46	17· 81	8·81	7· 93	12 67	5· 53	23·47	17·50	6·58	107· 76
St. Thomas—													
Morant Point Lighthouse	..	..	..	..	19· 88	0·99	5· 41	3·57	9· 69	20·93	16·08	16·08	92· 63
Bath	..	..	0·11	0· 22	18· 68	8·40	10· 24	10·58	13· 36	40·12	23·39	24·54	149· 64
St. Catherine—													
Spanish Town	..	1·50	1·78	4· 12	12· 94	0·40	1· 54	2·03	1· 40	22·14	8·10	5·01	60· 96
Dawkins Caymanas Estate	1·37	0·64	1·90	2· 51	9· 26	0·82	2· 28	4·23	1· 75	17·15	8·57	1·82	52· 30
Clarendon—													
Gibbon's Estate, Vere	..	..	1·21	0· 46	14· 17	2·13	3· 05	1·91	5· 34	29·19	14·01	5·39	76· 86
Chapelton	2·81	6·64	2·21	3· 62	13· 89	4·73	4· 57	4·26	3· 15	8·70	4·58	2·62	61· 78
Manchester—													
Litchfield	..	..	0·78	1· 99	24· 02	4·55	5· 63	5·825	5· 60	10·695	3·20	1·93	64· 22
Mandeville	..	..	13·16	4· 00	29· 20	7·75	7· 50	14·25	17· 00	40·50	11·05	10·50	154· 91
St. Elizabeth—													
Black River		0·40	3·10	4· 32	17· 54	2·86	3· 65	9·30	4· 97	14·63	7·62	2·72	71· 11
Hanover—													
Haughton Court, Lucan	..	..	..	..	..	..	..	4·30	10· 48	19·93	5·44	1·93	42· 08
Trelawny—													
Falmouth	..	..	0·78	0· 44	17· 10	1·41	0· 70	0·23	4· 04	5·81	13·48	1·95	45· 94
St. Andrew (barracks)—													
Up Park Camp	2·57	1·20	1·00	0· 95	9· 62	2·01	2· 30	3·70	3· 66	18·64	10·02	3·55	59· 22
Newcastle	7·23	4·05	2·45	9· 81	11· 89	4·29	5· 41	9·44	16· 65	28·52	29·10	10·80	135· 92
No. of Rainy Days, Up Park Camp	4	3	4	4	9	6	3	5	8	23	12	2	83
" " Newcastle	15	21	17	13	13	13	14	16	17	29	22	15	200

TABLE IV.

Monthly Record of Rainfall at the undermentioned Stations in Jamaica for the Year 1871.

Stations.	Jan.	Feb.	Mar.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Total.
Kingston—	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Plumb Point Lighthouse { Upper Gauge ..	·08	1·235	·17	·205	2·02	1·71	1·72	1·175	6·24	4·92	2·89	1·25	23·615
Plumb Point Lighthouse { Lower Gauge ..	·095	1·26	·14	·28	1·58	1·13	1·17	·79	4·38	3·65	2·83	1·095	18·390
St. Andrew—													
Ellerslie	1·15	2·14	1·63	3·44	2·61	2·12	7·13	4·35	8·57	6·02	9·36	3·85	52·37
Halfway Tree	·54	·73	·69	2·09	3·44	1·82	4·26	·66	5·92	5·25	6·29	·83	32·52
Stony Hill	2·57	1·19	1·79	6·49	9·62	1·30	6·11	4·33	7·82	8·20	9·10	5·07	63·59
Hope	..	..	..	..	..	..	..	..	..	2·43	8·33	1·38	12·14
Cinchona Plantation	5·24	3·10	4·17	4·10	6·14	3·26	3·91	3·17	9·31	15·65	15·14	9·64	82·83
St. Thomas—													
Morant Point Lighthouse	..	..	0·90	2·40	3·11	3·60	1·17	1·05	11·53	14·64	11·51	3·37	53·28
Bath	4·36	4·72	3·76	8·36	8·02	6·80	6·02	4·51	23·76	25·03	21·72	6·02	123·28
St. Catherine—													
Dawkins Caymanas Estate	1·14	1·25	3·70	3·72	1·27	·86	·81	1·29	4·25	4·79	2·07	1·47	26·62
Taylor's „ „	2·44	1·51	3·64	6·27	1·71	·97	1·97	1·19	6·02	5·96	3·16	1·34	36·18
St. Mary—													
Castleton Gardens	..	..	..	1·06	9·79	3·83	8·48	6·38	6·24	10·31	6·97	11·63	64·69
Clarendon—													
Ashley Hall	·37	1·42	2·06	1·49	1·92	1·02	3·10	1·80	8·11	4·19	6·52	·60	32·60
Chapelton	2·07	1·22	1·70	3·23	2·85	·84	2·76	4·13	5·09	10·52	5·78	3·48	43·67
Manchester—													
Mandeville	..	..	..	3·55	13·02	3·51	4·02	4·15	5·40	17·02	10·44	3·12	63·23
Cedar Grove	4·00	1·50	6·50	18·50	34·25	14·75	13·583	13·75	8·50	35·25	18·00	2·25	169·833
St. Elizabeth—													
Black River	1·03	3·92	2·86	3·79	5·66	2·99	4·31	3·95	2·46	8·30	4·73	4·17	48·17
Trelawny—													
Falmouth	3·20	1·86	2·78	·51	3·83	1·18	·71	1·09	2·38	5·38	1·13	1·38	25·43
Newcastle	2·97	2·53	2·19	3·74	6·80	6·82	3·95	7·43	11·15	13·0	..	..	..
No. of Rainy Days at Newcastle	14	11	4	10	16	6	14	10	8	21	..	..	..

TABLE V.

Monthly Record of Rainfall at the undermentioned Stations in Jamaica for the year 1872.

Station.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Kingston—	In.	In.	In.	In.	In.	In.	In.	In.	In	In.	In.	In.	In.
Director of Roads Office	·89	2·18	2·13	1·95	·79	·73	·64	2·07	1·79	·39	1·20	2·88	17·64
Plumb Point Lighthouse { Upper Gauge	·27	1·78	1·14	·14	1·05	·97	·71	4·49	1·20	2·30	2·49	·69	17·23
Plumb Point Lighthouse { Lower Gauge	·20	1·00	·72	·13	·94	·32	·29	2·25	0·72	1·13	·99	·30	8·99
St. Thomas—													
Morant Point Lighthouse	5·90	1·11	1·71	3·18	6·11	2·20	1·36	4·88	6·75	2·45	6·57	9·25	51·47
St. Andrew—													
Monaltrie	1·98	1·36	1·74	1·74	2·20	1·00	2·20	4·29	2·46	·81	1·53	2·32	23·63
Stony Hill	3·28	2·43	2·47	5·92	7·02	2·15	5·35	10·99	4·20	15·28	2·90	5·40	67·39
St. Mary—													
Castleton Gardens	4·01	4·44	6·63	5·06	8·80	3·66	7·56	6·90	9·93	3·67	4·14	8·76	73·56
Gayle Estate	..	..	2·20	1·86	6·07	2·23	1·00	3·60	4·38	5·43	6·86	8·29	41·92
St. Catherine—													
Dawkins Caymanas Estate	1·59	3·25	1·47	·41	2·58	1·72	·20	4·10	2·21	3·16	2·00	1·67	24·36
Taylor's „ „	1·19	3·78	1·52	·36	3·98	1·95	·78	4·71	3·59	2·67	2·67	2·41	29·61
Clarendon—													
Ashley Hall, Vere	·16	2·75	2·02	·21	1·76	·91	·17	3·77	6·82	3·94	3·00	1·57	27·08
Chapelton	2·66	2·54	3·43	1·13	7·01	·30	1·76	6·21	6·55	9·81	3·37	3·58	48·35
Manchester—													
Cedar Grove	17·50	2·12	3·50	·50	10·75	1·75	4·25	10·50	1·75	18·50	5·50	4·00	80·62
Mandeville	2·18	4·15	3·04	1·82	7·95	1·73	3·36	6·81	8·30	14·10	4·99	3·50	61·93
St. Elizabeth—													
Black River	2·88	2·55	2·63	1·45	6·76	4·03	6·74	7·07	4·77	7·25	5·66	3·96	55·75
St. James—													
Salter's Hill	2·18	3·54	5·62	4·09	9·17	5·91	3·73	8·92	5·04	8·84	2·08	3·90	63·02
St. Andrew—													
The Hope	..	..	..	2·00	1·99	1·49	3·05	6·69	4·35	4·14	2·79	3·08	39·40, approx.
Up Park Camp	..	.	..	2·29	2·66	1·47	1·96	4·81	0·85	0·61	1·60	3·62	....
Newcastle	2·56	3·84	7·18	6·57	3·35	0·34	4·84	7·65	9·88	14·07	1·43	4·60	66·32
No. of Rainy Days, The Hope	..	..	..	7	10	6	8	14	9	11	7	9	108, approx.
„ „ Up Park Camp	..	..	..	4	4	5	5	11	8	4	4	10	....
„ „ Newcastle	12	7	15	14	13	2	9	18	17	17	7	14	145

TABLE VI.

Monthly Record of Rainfall at the undermentioned Stations in Jamaica for the year 1873.

Station.	Jan.	Feb.	Mar.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	Total.
Kingston—	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Kingston	2·21	0·23	2·04	·00	1·05	0·15	0·19	8·34	12·41	9·71	0·20	1·36	37·99
Plumb Point Lighthouse { Upper Gauge	5·68	0·64	7·22	1·08	1·55	1·84	0·81	2·82	10·29	14·72	0·48	0·54	47·67
Plumb Point Lighthouse { Lower Gauge	2·30	0·29	2·41	0·43	0·56	0·35	0·30	9·96	7·00	16·20	0·54	0·57	40·91
St. Thomas—													
Morant Point Lighthouse	13·13	3·50	3·27	1·11	2·43	1·53	1·45	5·25	11·60	13·95	4·96	1·70	63·88
St. Andrew—													
Hope	4·20	·20	3 65	·00	3·87	1·75	1·25	12·79	19·92	4·77	2·44	2·22	57·06
Stony Hill	8·98	0·87	6·68	0·38	4·68	5 75	1·55	13·69	22·75	6·85	5·48	2·87	80·53
St. Catherine—													
Dawkins Caymanas Estate	3·33	·37	1·10	1·64	3 77	·96	1·11	6·06	22·23	3·36	1·48	1·43	46·84
Clarendon—													
Chapelton	5·12	1·70	4·13	1·19	6·01	2·20	2·61	9·59	14·54	14·50	2·09	1·35	65·03
Ashley Hall, Vere	5·78	1·02	4·12	1·03	2·41	1·64	·66	4·45	9·67	8·16	3·25	·98	43·17
Manchester—													
Mandeville	9·88	2·20	8·10	1·25	4·21	5·38	8·29	13·09	17·35	12·00	1·97	4·23	87·95
St. James—													
Salter's Hill	8·51	3·86	5·02	·60	12·88	5·91	5·15	4·56	7·12	7·60	3·66	12·50	77·37
St. Catherine—													
Linstead	5·98	3·30	4·10	1·50	2·91	5·16	4·31	7 45	11·40	7·73	3·14	3·27	60·25
Taylor's Caymanas Estate	4·10	·71	1·52	1·15	4·11	1·25	0·04	6·58	23·61	6·51	1·82	1·43	52·83
St. Elizabeth—													
Black River	3·58	·41	1·80	3·09	5·64	4·22	4·14	10·07	5·15	12·23	2·45	4·48	57·26
St Andrew—													
Monaltrie	2·33	·28	1·88	·00	1·73	·91	·51	10·23	8·10	14·29	·82	1·55	42·63
Up Park Camp	1·05	0·17	2·94	0·23	2·03	0·86	0·52	9·90	9·14	14·97	0·08	1·30	43·19
No. of Rainy Days, Up Park Camp	10	1	6	2	4	3	3	11	11	9	1	3	

TABLE VII.

Monthly Record of Rainfall at the undermentioned Stations in Jamaica for the year 1874.

Station.	Jan.	Feb.	Mar.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	Total.
Kingston—	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Director of Roads Office	1·92	0·31	0·29	1·12	1·25	4·65	0·77	5·01	4·88	8·62	11·70	0·93	42·07
Plumb Point Lighthouse { Upper Gauge	1·03	0·37	0·01	1·06	2·61	5·19	1·25	7·10	4·50	8·00	13·11	0·14	41·44
Plumb Point Lighthouse { Lower Gauge	1·16	0·35	0·02	1·63	3·23	5·70	1·39	7·38	5·15	9·55	10·01	0·88	47·10
St. Thomas—													
Morant Point Lighthouse	4·60	2·01	0·80	1·81	20·04	5·80	4·30	5·90	6·40	10·30	11·40	2·80	84·76
St. Andrew—													
Hope	3·56	1·39	..	2·14	6·38	2·61	0·88	10·99	4·12	9·05	7·64	1·40	51·30
Stony Hill	8·53	4·12	0·19	3·76	8·05	4·52	2·54	10·01	7·33	12·76	11·12	2·09	84·09
Cinchona Plantation	10·81	4·09	0·14	6·62	7·94	7·10	3·10	8·80	4·61	20·18	9·07	3·87	106·10
Monaltrie Pen	1·61	0·48	0·34	0·82	2·57	2·91	2·16	6·04	3·91	11·30	12·48	2·11	48·71
Clarendon—													
Chapelton	0·90	1·55	0·50	3·60	10·45	1·49	1·87	8·86	6·88	13·78	3·41	2·41	81·78
Ashley Hall, Vere	2·37	0·52	0·54	4·74	11·11	2·94	1·36	11·08	9·01	18·89	8·88	1·87	71·49
Manchester—													
Mandeville	1·88	1·30	1·79	4·70	10·61	3·87	2·98	14·66	7·94	11·44	9·31	2·11	98·93
St. James—													
Salter's Hill	3·03	0·63	0·99	7·60	14·64	3·96	5·46	10·09	13·18	24·80	7·30	1·86	91·09
Latimer Estate	2·11	0·40	0·82	7·45	14·93	4·88	4·09	11·89	8·22	8·89	6·78	2·66	71·01
St. Catherine—													
Linstead	3·81	4·07	0·95	4·07	7·33	5·09	0·69	9·79	4·81	8·14	9·70	..	60·40
Taylor's Caymanas Estate	2·33	1·25	0·74	1·35	6·79	3·84	1·67	9·66	7·01	11·71	9·64	0·47	66·46
St. Elizabeth—													
Black River	1·00	2·46	2·10	1·78	4·80	0·55	2·46	10·91	4·00	8·01	8·19	2·48	48·11
St. Mary—													
Botanic Gardens, Castleton	17·98	3·54	0·90	13·19	20·45	4·65	3·18	12·00	9·08	14·09	21·82	3·41	129·89
Up Park Camp	1·61	0·65	0·26	1·20	1·55	2·14	..	..	..	13·61	10·74	4·60	..
Newcastle	7·10	2·50	1·70	3·78	8·48	5·38	..	..	..	..	..	..	..
No. of Rainy Days, Newcastle	19	8	5	2	25	14	..	..	..	..	..	..	..

TABLE VIII.

Monthly Record of Rainfall at the undermentioned Stations in Jamaica for the year 1875.

Station.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	October.	Nov.	Dec.	Total.
Kingston—	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Kingston	1·13	·39	1·73	·69	4·71	·19	1·15	2·12	7·23	4·65	·49	·00	24·48
Plumb Point Lighthouse (Upper Gauge)	0·17	0·08	0·92	1·23	3·68	0·30	0·95	1·65	10·31	3·86	0·19	0·61	23·95
Plumb Point Lighthouse (Lower Gauge)	0·20	0·10	1·03	1·70	4·65	0·32	1·11	2·05	10·49	3·67	0·20	0·88	26·40
St. Thomas—													
Morant Point Lighthouse	5·76	2·28	3·10	3·95	7·30	3·25	0·50	..	..	2·30	1·91	5·50	35·85
St. Andrew—													
Cinchona Plantation	5·89	1·30	8·24	16·15	7·49	2·29	3·90	4·92	27·80	11·55	4·85	8·39	104·77
St. Catherine—													
Taylor's Caymanas Estate	0·28	1·23	1·33	4·72	7·35	0·85	1·21	3·43	6·03	5·28	3·26	1·59	36·56
Manchester—													
Mandeville	4·86	0·34	1·49	4·08	13·49	3·07	5·33	5·13	6·13	7·55	1·60	1·77	54·84
Cedar Grove	8·75	9·75	..	7·00	13·50	4·75	7·75	11·25	15·50	28·25	22·25	1·00	129·75
St. Andrew—													
Monaltrie	0·93	0·38	1·40	2·97	5·47	1·45	3·34	1·93	9·53	5·97	0·59	1·70	35·66
St James—													
Salter's Hill	1·21	0·03	2·76	3·26	15·09	7·40	7·28	8·60	6·32	10·58	3·12	10·33	75·98
Content	2·72	·50	1·07	1·65	8·90	1·90	1·60	8·11	5·75	2·85	1·40	10·40	46·85
Ashley Hill	·55	·82	3·06	3·94	13·33	1·73	1·73	4·67	6·68	6·03	1·64	·66	44·84
St. Andrew—													
The Hope	0·82	0·69	2·17	0·76	2·40	0·72	2·01	3·31	8·59	7·35	0·30	2·00	31·12
Up Park Camp	1·24	0·14	1·93	1·60	6·42	1·55	1·03	3·16	8·55	7·20	0·16	6·05	39·03
Newcastle	1·81	1·60	5·20	4·13	9·10	5·38	4·34	3·94	17·32	10·55	1·66	9·15	73·60
No. of Rainy Days, The Hope	2	2	3	2	5	1	7	10	9	8	2	7	58
,, ,, Up Park Camp	3	3	10	6	8	5	6	12	12	7	4	8	..
,, ,, Newcastle	7	2	9	10	16	10	11	13	12	9	5	16	..

TABLE IX.

Monthly Record of Rainfall at the undermentioned Stations in Jamaica for the year 1876.

Station.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	October.	Nov.	Dec.	Total.
Kingston—	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Director of Roads Office	2·10	·26	·07	·93	4·91	1·55	5·24	2·35	3·63	11·97*	3·51	4·29	40·81
Plumb Point Lighthouse { Upper Gauge	1·57	·06	·06	·98	3·35	·88	6·05	2·67	1·85	14·06	4·29	2·72	38·54
Plumb Point Lighthouse { Lower Gauge	2·17	·65	·33	·76	3·71	·61	6·54	3·22	2·27	14·54	4·74	2·99	42·53
Palisades	1·72	..	· 9	·61	3·94	·49	6·69	3· 5	2·57	13·59	4· 3	2·91	39·69
St. Andrew—													
Cinchona Plantation	26·46	0·80	3·55	8·61	6·70	5·43	9·59	4·98	10·36	32·32	12·50	4·33	125·63
Monaltrie	2·12	·43	·69	·80	4·31	·65	6·06	3·13	5·00	15·21	5·29	2·13	45·82
St. Thomas—													
Morant Point Lighthouse	6·95	1·13	1·30	2·52	3·79	9·26	6·58	7· 7	5·23	8·75	12·67	4·96	70·21
Hordley Estate	8·50	3·00	·50	1·50	3·50	7·50	7·00	9·00	8·00	13·00	12·10	11·40	85·00
St Catherine—													
Taylor's Caymanas Estate	1·39	0·35	0·70	2·98	8·82	0·76	8·61	3·65	4·69	14·00	5·43	2·47	53·85
St. Mary—													
Castleton Gardens	19·98	..	6·30	5·11	18·66	8·25	10·50	10·00	7·60	10·00	15·71	4·95	117·06
Clarendon—													
New Yarmouth Estate	1·30	·70	2· 5	2·37	5·53	7· 7	12·33	3·20	6·10	12· 6	5·90	9·50	68·11
Manchester—													
Mandeville	·82	1·01	·74	10·37	17·53	7·19	13·83	5·60	8·34	29·50	12·58	7·17	114·68
St. James—													
Salter's Hill	9·07	·62	·66	2·48	13·31	14·15	8·16	9·02	2·95	6·73	5·01	7·50	79·66
Content Estate	6·73	·80	·49	1·35	6·5	5·25	·80	3·75	3·40	3·72	6·10	4·95	43·39
St. Andrew—													
The Hope	4·48	0·42	0·05	4·94	4·75	1·55	7·19	6·52	4·30	16·36	7·54	2·29	64·34
Up Park Camp	2·93	0·54	0·03	1·61	3·76	1·40	6·59	4·09	6·23	14·74	6·03	3·14	51·09
Newcastle	16·45	0·70	2·15	12·15	8·11	9·02	10·68	9·28	11·65	27·17	12·63	4·21	124·20
No. of Rainy Days, The Hope	6	1	1	13	10	5	9	15	9	16†	10	4	99
" " Up Park Camp	7	4	1	4	8	4	11	10	13	16	18	17	..
" " Newcastle	15	4	6	18	25	17	9	16	18	19	21	10	..

* The greatest rainfall, or rather the heaviest shower per minute, was 1-in. in 20 minutes. † Highest in 1 day 5·45.

that the observations should not have been taken at a greater number of places and with greater regularity, but we must be thankful for small mercies in Jamaica, and I really did not think that I could have obtained all the information that Mr. Target has been good enough to gather for me. Unfortunately, the Island Government never took the matter up in earnest, and most of the observations have been carried out by private individuals at the instance of General Mann, the Director of Roads. The Government has it in its power to carry out the most perfect series of observations throughout the country by means of its road surveyors, medical officers, &c., who are stationed in the most remote parts, but I do not think the desirability of doing so has ever yet been forcibly pointed out to them. The Government is afraid of incurring any expense that it can possibly avoid, and would question the advisability of expending any money whatever, unless it saw a chance of an immediate return. A thorough system of taking observations is of even greater importance in a tropical climate than in a temperate one, for in the tropics our prosperity rests upon the yield of the sugar cane and the coffee tree, which depends almost entirely, at least in Jamaica, on the rainfall.

I would notice that about Kingston, at any rate, the clouds begin to form round the mountains to the north of the town; they then gradually sweep down the mountain sides, so that the rain does not reach the sea-coast until after it has been raining an hour or more in the hills. In fact, very frequently the rain never reaches the town at all, for I find that in 1870 it rained on 200 days in Newcastle, and only on 83 days at the Camp near Kingston, although the distance between both places is only nine miles. The rain sometimes approaches Kingston from the south-east, but I have never seen it approach from the west or south-west, and very seldom from the north-west. Rain very seldom falls before noon except in the rainy season, when we may have a week or two of incessant downpour. It also very seldom falls after sunset, though the sky frequently remains cloudy until nine o'clock.

In Kingston the sea breeze blows from the South-east, and during the daytime very rarely blows from any other direction. Unfortunately I have no table of observations taken in Kingston, but from a record kept at Newcastle I find it blew there in the year 1866, 298 times from the SE, 29 from the NE, and 19 from the N. The direction in Kingston would probably be the same. I believe the sea breeze then follows the same laws as at other places; it commences between nine and ten in the morning, blows most intensely from about one o'clock till four o'clock, and completely dies away by six. It is succeeded by the land wind, which rises about nine, and blows until six or seven next morning. This is a much more gentle wind, though, than the sea breeze. The sea breeze blows most fiercely in the months of February and March, but in the rainy season it is scarcely perceptible.

The evaporation varies from 0·1 in. to 0·8 in. per diem near Kingston; where the sky is generally cloudless, and a fierce breeze blows most of the day. Elsewhere there is no doubt that the evaporation is much less, but as far as I am aware, no observations have been carried out systematically. The experiments which Mr. Target made were only for a short period; a

floating gauge of about 12 in. square, and 9 in. deep was used. Mr. Target writes that he is now making much more systematic observations on evaporation at Hope.

III. *Notes on the Meteorology and Physical Geography of the West Coast of Africa, from Cape Verd to the Cape of Good Hope.* By Commander Edmund George Bourke, R.N., F.M.S.

[Received September 21st.—Read December 19th, 1877.]

Having passed five years on the above-named coast, during the whole of which period I took observations on the winds, weather, currents, &c., there prevalent, I am induced to embody the results in a short account, hoping that they may throw some light on the Meteorology of those regions; if nothing new be produced, previously known facts will be corroborated.

The winds that prevail on these coasts are already so well known as to render much comment unnecessary, the usual sea and land breezes being, with few exceptions, constant; the latter, however, are nowhere very strong, and as a rule are not felt before midnight, nor do they last later than 8 a.m. The sea breeze commences at about 10 a.m., reaches its maximum strength at 4 p.m., and then gradually falls light; but frequently, and especially in the Gulf of Guinea, it maintains its full strength until it suddenly drops and gives place to the land breeze. The sea breeze blows from W to NW to the north of Cape Palmas, to the south of that point it is from SSW to WSW (true). North of Cape Palmas the land breeze comes from E to ENE, from Cape Palmas to Fernando Po from the NW, thence to Cape Lopez (lat. 1° S) from the E, and to the south of that Cape it is from the SE. These breezes nowhere extend far from the shore, as at a distance of 20 miles to seaward the constant SW monsoon is but rarely disturbed, and then only by tornadoes and the Harmattan.

To the north of the parallel of 10° N, and during the northern winter months, a strong N to NE wind prevails throughout the 24 hours, and brings for the latitude very cold weather. In proceeding from Sierra Leone towards the river Gambia during the prevalence of this wind the change is most marked; for instance, in February, 1865, at the former place (lat. 8° 30′ N) the temperature varied from 85° as a maximum by day to 75° as a minimum by night, whereas at Goree Island (in lat. 14° 40′ N) it was from 69° to 62°, and the greater part of this fall of temperature occurred suddenly in about 11° N latitude, at the point where the north wind was first felt, and where a cold south current was also entered.

To the south of Cape Frio (lat. 18° S) the wind is almost always from the south; in the southern summer it is very fresh, and extends as far as the Cape of Good Hope, being apparently a continuation of the strong SE winds there prevalent at that season; in winter it is lighter with occasional calms, and south of the tropics it is at that time interrupted by westerly gales, which increase in frequency and strength as the Cape of Good Hope is approached.

Tornadoes are met with as far as 10° south, and almost always come from the eastward or dead against the prevailing winds; they do not appear to have any rotatory motion, and have scarcely any effect on the barometer;—if they cause any change it is a slight rise on their approach. This is to be looked for, as they work dead against the usual wind, and the two currents of air seem to meet; certain it is that the SW wind blows till the squall reaches the observer, when a sudden change occurs to the NE. It appears to me that the cold upper current of air forces its way against and under the exceedingly hot and moist lower one, forcing it upwards, where it is rapidly condensed into the angry-looking clouds which fringe these storms, the tornado being in this way constantly fed with rain and electricity as it progresses. On the approach of a tornado the temperature frequently falls 15° in three or four minutes. I traced the path of one for 120 miles along the Gulf of Guinea, which travelled that distance in four hours, and its course was WSW (true). This tornado I observed on shore at Accra, and by referring to the logs of men-of-war which were at anchor off other places, I discovered its rate of progression.

Tornadoes are most violent and frequent in the neighbourhood of Sierra Leone, also at the island of Fernando Po; they are most frequent at the commencement and close of the rainy season (June to September), and are most violent at the former period; they do, however, occur occasionally throughout the dry season, but I have never seen one during the rainy season proper. They extend a long distance to seaward, in fact, all over the region of the SW monsoon, but diminish in frequency as the distance from the land increases. During the rainy season (June to September), especially in the Gulf of Guinea, the SW monsoon (it then being at its greatest strength) frequently blows home to the coast, obliterating the sea and land breezes. On these occasions the weather is most oppressive, as the night temperature remains very high, the diurnal range being but 3° or 4°.

During the winter months north of the Equator a wind called the Harmattan is experienced; it is very dry and parching, and is said to last sometimes for days, with disastrous effects on vegetation and wooden articles like furniture. During three seasons I never saw it last quite through the 24 hours. It usually commences by the land wind being rather strong and from the NE; instead of dying away as the sun gains altitude, it freshens and becomes very hot and dry. In January, 1874, whilst acting as Civil Commandant at Accra on the Gold Coast, I experienced the Harmattan, when the wind continued North till 2 p.m., at which time the temperature of the air in perfect shade was 90°, the wet bulb showing only 68°; the sea breeze then overpowered the Harmattan, but came in from ESE instead of from SW, and passing through S became a land breeze from the NW much earlier than usual. The air remained dry throughout the night; consequently, the sky being free from cloud, the thermometer fell to 65° in the shade and to 61° exposed on the ground; this gave a diurnal range of 25°, which is a most unusual circumstance to record in the tropics close to the sea, the temperature of which was

82°. During the two or three succeeding days this wind returned, but with constantly diminishing force and time of duration, and it did not again appear that season. The sky is cloudless during the Harmattan, but the atmosphere is very hazy owing to its being loaded with fine dust; the haze is prevalent during the whole season, so that whether the Harmattan be felt on the surface of the earth or not, it is probably going on in the upper regions of the atmosphere. By the motions of the upper clouds the NE trade seems to be always blowing over the northern parts of West Africa, and it may be that the Harmattan is only the NE trade, extending itself to the surface from unusual strength or other, at present unknown, causes. I observed sheet lightning every evening during the continuance of this wind, but only to seaward, which was doubtless due to the rapid evaporation from the surface of the sea, owing to its being in contact with such very dry air.

The chief characteristic of the climate of the coast of Western Africa is moisture, which is accompanied by a temperature by no means high for the latitude. This averages, between the Equator and 10° N, 79°; from the Equator to 10° S it is from 4° to 5° lower; to the southward of 10° S the rainy season becomes less and less marked until reaching 16° or 17° S, where rain is scarcely known. From this latitude to 25° S the climate is most peculiar, it being rainless, with the wind constantly blowing from SSW to SSE, and with a temperature always low for the latitude. At Little Fish Bay (lat. 15° S) in July, 1865 (the coldest month of the year), the maximum temperature was 61° to 63°, the minimum being 56° to 58°; at the same place, in December, 1872 (a hot month), the maximum was only 70° and the minimum as low as 62°, all these being very cold for a place within 15° of the Equator.

Off Cape Frio the diminution of temperature is even more remarkable, it being in December 61° to 65°, in April 70° to 73°, and in June only 58° to 60°.

The heat in the Gulf of Guinea and for 8° on each side of the Equator is never excessive, a reading of 90° in the shade being exceptional; the moisture of the air is very great except during the Harmattan wind; the maximum difference between dry and wet bulbs rarely reaches 7°, and during the greater part of the nights complete saturation is frequently registered, with copious dews.

From 0° to 10° N the coldest time of the year is during the rains, the mean temperature being then about 78°; but from 0° to 10° S the coldest period is during the dry season of that region, the average temperature being about 70°. This apparent anomaly is due to the fact of the cold seasons occurring simultaneously; the temperature of the Gulf of Guinea as far as Cape Palmas being governed by the seasons of the southern hemisphere, instead of corresponding to those of the northern, in which it is situated: nevertheless, the rains occur normally, *i.e.*, when the sun is on the same side of the Equator as the place.

North of the Equator the dry season is from December to March, and the rains occur, with mists and fog, from June to September, the weather in the

intervals being hot with tornadoes. South of the Equator the seasons are less marked, the weather being dry and cold from May to November, and rainy with tornadoes during the remainder of the year.

The accompanying table is compiled from my own observations, taken when serving in H.M.S. 'Rattlesnake' and 'Torch,' 1864-1867, and in H.M.S. 'Druid,' 1872-1874 :—

TABLE showing Temperature of the Air from Daily Observations during each Month.

Month.	0° to 10° N.			0° to 10° S.		
	Max.	Min.	Mean.	Max.	Min.	Mean.
	°	°	°	°	°	°
January	90* / 86	65* / 72	81	84	72	79
February	87	70	80	84	75	79
March	88	76	82	87	74	81
April	89	72	83	88	74	81
May	87	71	81	85	72	77
June	84	70	77	81	63	74
July	82	69	75	..	..	71
August	80	69	73	79	63	70
September	80	69	74	..	..	72
October	85	71	78	..	..	74
November	87	71	82	84	71	77
December	87	70	81	86	72	78

* Harmattan Wind.

A heavy swell from the South Atlantic prevails at all points to the southward of Sierra Leone; this from its origin is the most violent during the southern winter.

There are three distinct currents met with on the coasts with which I am dealing. 1st. One setting to the south on the north-west coast of Africa, which, after passing Cape Verd, trends to the south-west and westward; this is a cold stream, its temperature being lowest very close to the shore; off Goree Island (lat. 14° 40′ N), in February, it was only 68°. I again experienced it off the River Gambia (lat. 13° N) in March, 1865, when its temperature was 65°, the stream of that river being then fully 10° higher. In March, 1874, on leaving the Gambia, the river water being 72°, this current setting south, half a knot an hour, was encountered close to the land at a temperature of only 61°; on steering to the WNW, that is, to seaward, the water rapidly grew warmer (notwithstanding an increase of latitude) until nearing the Cape de Verd Islands, when a maximum of 72° was recorded. This cold water caused the air to be very cold and misty near the land; it seems to creep to the southward close in shore, or it may come up from lower depths. It prevails from December to April, when the NE trades blow close to the land and well to the southward. 2nd. Another current of even colder water, which apparently comes from the SW of the Cape of Good Hope, runs to the northward along the west coast of South Africa. This, like the one off Cape Verd, is very cold close

to the shore; it, however, prevails throughout the year as far as Cape Frio (lat. 18° S). Table Bay is filled with it; in January (Midsummer) its temperature there was only 52°, whereas in False Bay (which usually contains warm water coming from the east) the temperature of the sea was 67°. A strong NW gale often drives the cold water round the Cape of Good Hope or blows the warm water away from the shore, when the cold, if near at hand, rises to replace it. In Simon's Bay the temperature of the sea falls 15° during a NW gale. In May I found the water 20 miles to the westward of the Cape of Good Hope to be 65°, when in Simon's Bay, with a NW wind, it was only 51°. Proceeding in that month to the north-west from Table Bay, this cold water is found all along the coast; off Cape Frio its temperature was only 56°, the air cooled by the sea was almost saturated, and heavy mists hung over the water, when, at the same time, it could be distinctly seen that over the land the sun was shining brilliantly in a cloudless sky, and an observer on the shore (which was here a sandy desert) would probably have seen a fog-bank to seaward; very heavy dews prevailed all night. At this season (May) this cold water does not extend much to the northward of Cape Frio (18° S), but the current continues to run to the northwest until it approaches the Equator, when it changes its course towards the westward, and is then known as the Equatorial current. 3rd. During the southern winter (June to September) the cold water appears to extend from the Cape of Good Hope to the Equator, and thence as far as 30° W; it is then very cold. I crossed it twice in July, 1873, in proceeding from the Gold Coast to Ascension and back, in lat. 0° to 2° S, long. 5° to 9° W, and found its temperature down to 70°, the water to the northward being at 80°, and that to the southward at 79°; the strength of the current between these points was from 30 to 45 miles a day, the mean direction being WNW (true). This cold water was green, the weather being fine but cool and misty, with much dew at night.

In May the Equatorial current is much warmer; at the island of Anno Bom, lat. 1° S, long. 5° E, its temperature in that month was 85°, and the current was running NW by W at a rate of 1½ knots per hour. But the most remarkable feature of this NW current from the Cape of Good Hope is the sudden manner in which its cold waters simultaneously appear along the land to the northward of Cape Frio; for instance, at Little Fish Bay (15° S), early in June, it was only 61°, on leaving which and steering due west the temperature rose until it reached 71° at the island of St. Helena; again, in the harbour of St. Paul de Loanda, about the 20th June, 1865, the temperature of the water fell in a few days from 73° to 66°. In August, 1866, this cold water was found in Kabenda Bay (lat. 5° S), to reach which it must have passed under the warm and rapid stream of the River Congo, whose waters were 10° higher. This cold water leaves the coast between lat. 0° to 15° S in September. In June, 1867, it appeared again in Kabenda Bay (5° S) at precisely the same date on which I had two years previously observed its arrival at St. Paul de Loanda (8½° S). On each occasion the temperature of the water fell from 73° to 66°. Proceeding south in December,

1872, in a steady current, setting NW about half a knot an hour, in lat. 11° 34′ S, long. 12° 25′ E, the temperature of the sea was 81°, and on reaching 18° 18′ S and 11° 50′ E it had fallen to 60°. Proceeding north in April, 1873, in 18° 43′ S, 11° 51′ E, the temperature of the sea was 67°, and on the following day it had risen to 83°, the ship having in the interval only made a course of N 12° W, 94′; on this occasion the hot water seemed to come out of the large bay to the southward of St. Paul de Loanda, and I believe that during the hot season (October to June) a southerly set is found there, but it is difficult to account for the sudden increase of the temperature of this apparently continuous NW current, which takes place between 18° and 12° S during the southern summer. In June, 1872, the difference was even more strongly marked, as in 17° 55′ S, 11° 50′ E, this water was at 56°, and in 10° 8′ S, 11° 55′ E, at 79°. The cold water found on the Equator from July to September, and which extends to long. 25° W, is doubtless a continuation of this NW current; and though I have no observations to show that the water is so remarkably cold between 12° and 2° S, still I feel sure that it is so there during those months.

Temperature of Equatorial Current. Lat. 2° S. Long. 5° W.

	°		°
January	81	July	71
February	82	August	70
March	82	September	71
April	81	October	76
May	79	November	77
June	77	December	80

This Table is from my own observations.

Between the two cold currents is a warm one called the Guinea current; it sets to the eastward into the Gulf of Guinea towards Fernando Po; its strength is at a maximum in June and July, when it attains a rate of 2½ knots per hour; at that season it has been felt as far as 30° W, the SW monsoon being then at its height. In January it does not extend far to the westward of Cape Palmas; its limits in latitude are from the Coast of Guinea to about 1° N. During the Harmattan season its direction is sometimes reversed, but I have only observed this close to the land, and do not think it ever occurs in the strength of the current.

Temperature of Guinea Current. Lat. 3° N. Long. 3° W.

	°		°
January	82	July	79
February	81	August	78
March	83	September	78
April	85	October	80
May	84	November	82
June	80	December	82

The above is from my own observations.

The remarkable visit of very cold water to the coast between 5° and 15° S

latitudes, which has been already described, has its counterpart on the Gold Coast and in the Bight of Benin; it occurs at the same period (June), and appears to me to be the cold current from the southward, passing under the Guinea current and rising to the surface up the slope of the shore. Cold water appears occasionally on the Coast of Guinea at all seasons, but during July, August, and September the temperature of the sea off Cape Coast Castle is frequently and for days together as low as 68° to 66°; the water contains at those times swarms of jelly fish, and whales are numerous; on leaving the coast and getting out of soundings, the temperature rises to 78° or 80°, which is the normal of the Guinea current at that season.

I have detected this cold water as far west as Cape Palmas, but not on the surface. When lying at anchor there, October 4th, 1872, I observed that the water coming from a pump was very cold, the temperature of the sea surface being 80°, the ship being also in the Guinea current, which was running strongly round the Cape to the eastward. On testing the water below the surface I found the temperature as follows:—

Surface.	1½ Fathoms.	3 Fathoms.	8 Fathoms (bottom).
80°	74°	68°	65°

This difference I afterwards observed at many points between Cape Palmas and the Bight of Benin, but only from the end of May to the beginning of October. It will be seen that it is precisely during this period that cold water is present on the coast 800 miles further to the south; I therefore conclude the same causes act in both instances. This cold layer of water below disappears in October, and the temperature of the water is after that, and in comparatively shallow water (10 to 15 fathoms), nearly uniform from the surface to the bottom.

This cold surface water of the sea seems to have a peculiar effect on the weather in the tropics, as when it is present there is but little wind or sunshine, the air is laden with moisture, and, being so near in temperature to its dew-point, admits of but 2° or 3° diurnal range; heavy misty clouds hang about, nothing dries, the functions of nature appear to be suspended and the effect is most depressing.

The following observation, which I recorded when lying at anchor in Simon's Bay in January, 1873, may be interesting to meteorologists. There was a light breeze from SE blowing, with a cloudless sky and most intensely hot sun; the wind being from the sea, the air was cool and comparatively moist, the temperature of dry bulb being 75°, wet 68°; suddenly the wind changed to NW and came off the highly-heated sandy land, the effect of which was to run the dry bulb thermometer up to 84° and to drive the wet one down to 63°, and so rapid was the change that I could plainly see the mercury rising in one instrument and falling in the other.

DISCUSSION.

Mr. STRACHAN remarked that he thought it a very extraordinary fact that the temperature of the surface water in the Gulf of Guinea being about 80°, yet at only eight fathoms below it was 65°. It would be interesting to describe the

means adopted to get that result. The deep temperature in this Gulf should be tried as soon as possible by means of Negretti's newly invented Standard Deep-sea Thermometer. Such a great difference in temperature in shallow water would afford an excellent field for testing the reliability of this instrument against the protected Six's thermometer.

Mr. SCOTT said that Captain Toynbee, who was unavoidably absent, had requested him to express the deep sense which he (Captain Toynbee) held of the interest and value of Captain Bourke's paper. There was no doubt that officers in the Royal Navy could contribute immensely to the advance of the science by carefully working out the various local phenomena presented by the climates of the stations in which they might chance to be located. Moreover men of war, especially surveying ships, were often in waters rarely, if ever, visited by merchant ships.

Mr. GREAVES asked if Captain Bourke had noticed any relation between the amount of dew and the force of the sea-breeze. He had been led to imagine the deposit and re-evaporation of the aqueous vapour to afford a better explanation of land and sea-breezes so uniformly recurring, than the mere expansion and diminution of the whole volume of the atmosphere, by the diurnal change in temperature. He had advocated this idea while residing himself within the tropics, even to the extent of saying that the greater the dew the greater would be the sea-breeze ; but he had never been in a position to bring the theory to an unequivocal test.

Captain BOURKE said that he had dealt mainly with the coasts, most of the observations having been made a few miles from the shore, therefore Mr. Strachan's remarks would not fairly apply to his paper. He had never found recorded similar observations to those he had made in the Sailing Directions (which were supplied to Her Majesty's ships, and were supposed to contain the latest information on the subject). As far as he could remember (for he had not taken notes on the subject) the amount of dew was greatest when there was least wind. How he found out the remarkable temperature in the Gulf of Guinea was that the decks were being washed, and walking about without any boots on, he felt the water on deck, (which was drawn by a pump from some depth below the surface of the sea) of a delightfully cool temperature. He then took a minimum thermometer and lowered it fathom by fathom to the bottom at a depth of eight fathoms ; as the thermometer was kept quite horizontal, and as the temperature decreased regularly downwards, he was sure that the reading was quite correct. He had noticed that when the sea breeze was stronger, the land breeze was also stronger.

IV. *On the Meteorological Observations made in the Norwegian Deep-sea Research Expedition in the summers of* 1876 *and* 1877.

By PROFESSOR H. MOHN, Hon. Member M.S., Director of the Norwegian Meteorological Institute.

[Received November 26th—Read December 19th, 1877.]

THE ship hired for the Expedition was the screw steamer, "Vöringen," of Bergen. She is of 400 tons burden, 145 feet long, 23 feet broad, and draws 13 feet of water abaft. The middle part of the ship is covered by a spar deck. Below the main deck, about midships, was the scientific working room, which received its light from a large skylight, covering the main hatch.

Pressure of the air.—A marine barometer (Adie No. 1493) was suspended on the fore bulkhead of the working-room, as near the midship section as possible, and had a very good light from the skylight above. It had been

verified at Kew, and subsequently compared through the winter 1875-76 at Christiania with the standard barometer of the Meteorological Institute. Its cistern was so near the surface of the sea, that the correction of the readings to the sea level was only + 0·1mm.

In 1876 the barometrical observations were all made with this instrument; its readings were checked before, during, and after the voyage, by comparison with the travelling standard barometer of the Meteorological Institute, a Fortin made by Negretti and Zambra, and the constant correction found to be unchanged. The reading of this instrument was attended by some inconveniences. Even in a moderate sea the barometer pumped so much, particularly when the ship was pitching, that the only way of obtaining a good observation was to try to catch the highest and lowest readings and take the mean of them. But this often required very much time, and was very troublesome when a lantern had to be used and the sea was rough; of course, the observations could not, in such cases, be so good as with a fixed barometer. In 1876, the average weather which the expedition met with was very boisterous; still the barometrical observations show, by their discussion, a very regular diurnal period.

In 1877 the same marine barometer was suspended in its former place. Its constant correction had been checked several times by comparison with a Kew station barometer, verified at Kew and at Christiania; but in order to avoid the inconveniences which attended its reading, I put up a good aneroid barometer in the house, which had been erected on the spar deck for the navigating work, and let the observers (the officers of the ship) take the readings by this instrument. With this arrangement all the meteorological instruments were on the fore part of the deck, and the officer of the watch was not obliged to leave the deck for reading the barometer. The readings of the aneroid, its temperature and height, were taken in a few seconds, and the tenth of a millimetre read off easily in all sorts of weather. The aneroid was compared by myself with the mercurial barometer in the working-room once, and sometimes twice, every day, when the sea was sufficiently quiet to allow an accurate reading of the latter. In this manner I obtained from the 15th of June to the 16th of August, 49 comparisons. By the method of the least squares I find from them the following equation for the errors of the aneroid, in which N is the true pressure in millimetres, A the reading of the aneroid, t its temperature in centigrade degrees, and d the number of the day of comparison, reckoned from the 15th of June 1877.

$$N = A - 0{\cdot}11157.t + 0{\cdot}06638\ (760 - A) + 0{\cdot}000292.d.$$

From June 15 to August 16, is a period of 62 days. Putting $d = 62$, we get that $0{\cdot}00292d. = 0{\cdot}181$. Hence the change of the correction of the aneroid during the whole cruise does not reach 0·2mm. The probable error of one comparison of the two barometers I find to be $\pm$ 0·196mm. As probably the larger part of this error is to be ascribed to the pumping and sluggishness of the mercurial barometer, we may regard the barometrical observations made in 1877, reduced by means of the above formula, as correct within the range of one tenth of a millimetre.

Temperature of the air.—It is difficult on board a steamer to find a suitable place for the thermometer. The first day we were under steam, June 1st, 1876, I went round the whole deck with a sling thermometer, and tried all the places likely to be suitable for giving the true temperature of the air. The result was the following arrangement, used both in 1876 and 1877.

The thermometers, dry and wet, were suspended in a copper case with covered sides, and a roof provided with a wide, covered funnel. This case was fastened in an outer case of wood, open at the top and bottom, and so long that it kept the copper case always in its shadow; both cases had doors, the inner one was about 20 centimetres, the outer one 40 centimetres in breadth. The wooden case with its contents was hoisted up under the fore-stay, no sail being bent, by means of a pulley and haulyard, and secured to the ship's sides by means of two guys, one on each side, fastened to the lower part of the case, and secured, one to the starboard, and one to the port side of the ship. When an observation was to be taken, a man lowered the case quickly, but gently, the doors were opened, and the readings made, the tenths of degrees being first noted, whereupon the case was closed and hoisted up in its place. The thermometers hung 6 metres above the sea, and were well exposed to the air, which had free circulation through the cases (sufficiently proved by the indications of the wet thermometer, as will be seen further on), were shaded from the sun's rays, from rain and radiation, and out of the reach of the spray. The smoke from the large funnel did not reach the case, nor the heated air from this source, as proved when the wind was right aft, under which circumstances a thermometer mounted precisely in the same way, close by the rudder, read exactly like the thermometer under the fore-stay. The smoke from the galley below the forecastle was the source of heat nearest to the thermometer, but its effect upon the temperature in the case was not appreciable, of which I convinced myself by means of the sling thermometer. The thermometers were duly compared with the standard, and divided to two-tenths of a degree.

In 1876 I had, as previously mentioned, a psychrometer mounted on the after-deck close by the rudder, but it was not used, as I found that the psychrometer forward worked well in all cases. In that year I had also a psychrometer and screen of the same sort as those furnished to British ships by the Meteorological Office, mounted on the fore bulkhead of the enclosure under the spar deck. This instrument read exactly like that under the fore-stay when the screen was in shadow; but as soon as it was reached by the sun, the instruments read higher. As I had no means of protecting it from the sun, without inconvenience to other purposes, I did not mount it in 1877.

I made, chiefly in 1876, some comparisons between the reading of the thermometer in the case under the fore-stay and that of a sling thermometer, which I swung on the foremost part of the spar deck, at the same height as the first named, some ten metres from it. The result of 6 series of observations, after correcting the readings, was, that the sling thermometer gave a temperature 0°·08C. lower than the protected one.

The humidity of the air.—I have already spoken of the thermometers used as a pyschrometer. In order to check the observations with the dry and wet

thermometers, I took with me a Daniell's hygrometer, made by Åderman, of Stockholm. With this instrument I made several observations, I myself observing the appearance and disappearance of the dew, and an assistant noting at the same time the inner thermometer. The instrument was placed freely exposed to the air, at the same height as the psychrometer, some ten metres from it, and the observers were standing on the leeward side of it. The observations of the hygrometer were not made without difficulty, as the quantity of ether to be employed in order to ensure a quick disappearance of the dew was to be found only by successive trials. I always took a series of observations. The comparison between the results found with the hygrometer and the psychrometer proved the otherwise well-known fact, that when the air is dry and the wind fresh, the psychrometer gives the vapour tension too low. The mean difference found in 1876, by eight series of observations, was 0·14mm.

Wind.—The direction of the wind was observed by the smoke from the funnel or by a pennant hoisted at the fore-topmast head, and by the standard compass, which was placed on the fore part of the spar deck. The direction was noted in degrees as nearly as possible.

The *force* of the wind was noted by the Beaufort scale. This notation was often inaccurate, because we were almost always under steam, and saw very few ships under sail, so that the observer had no evidence from the amount of sail carried to aid him in his judgment of the wind's force.

The *velocity* of the wind was measured with a Robinson's anemometer.

At the same time, when the wind observations were made, the course (direction of the ship's head) was noted by the standard compass, and the rate of the ship by the log. The deviation of the compass was each year very carefully determined by Capt. Wille. In 1876 the common log and patent log were used, but in 1877 we had a special logging machine. This last, as well as the anemometers, requires a special description.

The anemometer used in 1876 was an English one, sent many years ago from Admiral FitzRoy to the Director of the Norwegian Lighthouses. It had five dials, each divided on the limb in ten parts. The length of the arms from the centre of revolution to the centres of the cups was 0·1538 metre, and the diameter of the cups 0·1046 metre. When an observation was to be made, the observer took the instrument in his hand and kept it in a vertical position on a place on the spar deck where the wind was blowing with its full force; he then let the cups revolve freely. At the moment his watch showed 0 seconds, he observed the reading of the hand on the lowest dial, and when 80 seconds had elapsed, he observed its reading again, and lowered the instrument. Both readings of the dial were noted. Sometimes an hour glass was used instead of a watch.

The observations made with this anemometer have been computed by assuming that the wind's velocity was three times the velocity of the cup centres. But the results found have to be corrected, as it has been shown by the investigations on anemometers carried out in St. Petersburg under the direction of Professor Wild, that the assumption made is not admissible. Happily our anemometer has very nearly the same dimensions as one of those

tried in St. Petersburg by Mr. F. Dohrandt,* namely, the electrically registering No. 4, in which the length of the $r = 0{\cdot}1551$, and the diameter of the cups $= 0{\cdot}1044$. Both instruments are apparently made after the same model. By the last-named anemometer the ratio of the velocity of the wind to that of the cup centres is found to be 2·5293 instead of 3. The distance run by the wind in one revolution of the vertical axis of the anemometer is therefore $2\pi r \times 2{\cdot}5293$, or $2\pi \times 0{\cdot}1538$m. $\times$ 2·5293 or 2·445 metres. Ten revolutions of the axis = one division on the first dial = 24·45 metres.

The friction coefficient of the anemometer, or the smallest velocity of the wind capable of making the instrument revolve, was determined by the following experiment. On the first of June 1876, in the Sogne-Fjord, when the air was quite calm, the ship's distance run in sixteen minutes, as determined by excellent land bearings, was 3899·5 metres (2·1 nautical miles, latitude 61°). This gives a rate of $\frac{3899{\cdot}5}{960}$, or 4·062 metres per second. In the same interval of time the anemometer registered, freely exposed, 99·9 divisions of the first dial. To this number corresponds a distance run of 99·9 × 24·45m, or 2442·6 metres, and a mean rate of $\frac{2442{\cdot}6}{960}$, or 2·544 metres per second. The true velocity of the wind felt on board was consequently 4·062 metres per second, while the anemometer registered only 2·554 metres per second. The friction co-efficient is 4·062—2·544, or 1·518 metres per second, and the velocity of the wind is expressed by the formula

$$v = 1{\cdot}518 \times 2{\cdot}5293.\ k$$

where k is the velocity of the cup centres. If the number of divisions of the first dial registered in thirty seconds $= n$, the wind's distance run in thirty seconds is $24{\cdot}45 \times n$, and the velocity of the wind $\frac{24{\cdot}45 \times n}{30}$ or $0{\cdot}8150 \times n$ metres per second. The formula is then

$$v = 1{\cdot}518 \times 0{\cdot}8150.\ n.$$

Assuming the wind's velocity to be three times that of the cup centres, we should have the distance run by the wind during one revolution of the vertical axis to be $3 \times 2\pi r$, and during 10 revolutions $30 \times 2\pi r$, to which corresponds one division of the first dial. If the instrument registers n divisions in 30 seconds, or $\frac{n}{30}$ division in one second, the computed approximate velocity v^1 of the wind becomes $\frac{n}{30} \times 30 \times 2\pi r$ or $2\pi r\ n$, which = $0{\cdot}96667\ n$. We have in this manner

The true velocity $v = 1{\cdot}518 + 0{\cdot}81500.\ n$
The approximate velocity $v^1 = 0{\cdot}96667.\ n$
The correction $v - v^1 = 1{\cdot}518 - 0{\cdot}15167.\ n.$

* F. Dohrandt. Bestimmung der Anemometer-Constanten. Repertorium für Meteorologie, T. IV. No. 5.

Putting $n = \frac{v^1}{0{\cdot}96667}$ we get

$$v - v^1 = 1{\cdot}518 - \frac{0{\cdot}15167}{0{\cdot}96667} \cdot v^1$$

The correction $v - v^1 = 1{\cdot}518 - 0{\cdot}\ 1569\ v^1$

Or the true velocity $v = v^1\ (1 - 0{\cdot}1569) + 1{\cdot}518$

or $v = \quad 1{\cdot}518 \quad + 0{\cdot}8431.\ v^1$

The correction to be applied to the velocity v^1 as computed on the hypothesis of the wind's velocity being three times that of the cup centres, in order to get the true velocity v, is in our case nothing, when $v^1 = 9{\cdot}7$m; it is $+ 1{\cdot}5$m when v^1 is 0, and it is $-2{\cdot}3$m when $v^1 = 25{\cdot}0$m.

The anemometer used in 1877 was made in Christiania on my own design. In order to be certain of the true ratio between the velocity of the wind and that of the cup centres, I took the same dimensions as in the above-named anemometer, tested by Mr. Dohrandt, at St. Petersburg. The distance run by the wind during one revolution of the vertical axis is consequently $2{\cdot}5293 \times 2\,\pi r$, that is, $2{\cdot}5293 \times 2\,\pi \times 0{\cdot}1551$m, or $2{\cdot}4648$m. If the wind's velocity in metres per second be v, the number of revolutions in 80 seconds be n, and the friction coefficient a, we have

$$v = a + 2{\cdot}5293 \times 2\,\pi r \times \frac{n}{80} = a + 2{\cdot}4648.\ \frac{n}{80} = a + 0{\cdot}8216\ n.$$

The wheelwork is so arranged that the hand reads off on the dial immediately the value of $0{\cdot}8216n$ in metres per second, when the registration has lasted 80 seconds. This has been made in the following manner. Fig. 1 represents the anemometer in $\frac{1}{10}$ of its real size. The upper part requires no

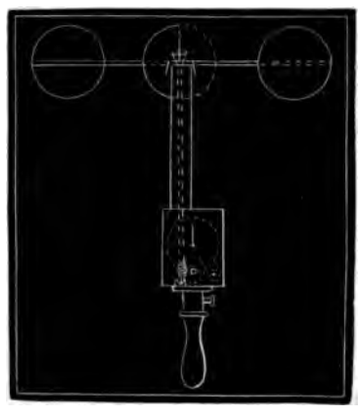


Fig. 1.

description, the lower part is a handle by which it is held during the observation. The cups are secured to the arms with great care, in order to keep the value of r unchanged, and to prevent the cups from flying off. A cylindrical cup in connection with the revolving arms encloses the uppermost part of the tube through which the vertical axis runs, and prevents rain getting into the

inner part of the instrument along the axis. The registering part is shown in fig. 2, in one half of the real size. The endless screw on the axis turns a smaller wheel *b*, which has 28 teeth. On the same axis as *b* is a cogwheel

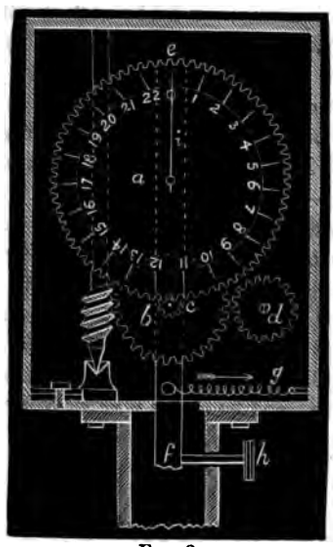


FIG. 2.

with eight teeth, which again turns the large wheel *a*, which has 80 teeth. Consequently ten revolutions of *b* correspond to one revolution of *a*. 28 revolutions of the vertical axis give one revolution of *b*. 280 revolutions of the vertical axis give ten revolutions of *b* and one revolution of *a*. Putting $n = 280$, we have $v = a \times 0{\cdot}08216 \times 280 = 23{\cdot}00$.

The dial *a* is now divided by radial lines on its limb into 28 equal parts, and each part again by dots into fifths, so that tenths can easily be read off. If the index *i* points to zero on the dial *a* before registration, it will, after a registration in 30 seconds, immediately indicate the value of $0{\cdot}08216\ n$, or $v - a$, that is the velocity of the wind *minus* the friction coefficient expressed in metres per second. In order to get the true velocity of the wind, we have only to let the instrument register for 30 seconds, read off the dial and index, and add the number expressing the friction coefficient.

The registration in a definite interval of time is brought about in the following manner. The wheels, *a*, *b* and *c*, have their axles fixed in the *moveable* arm *ef*, which turns about a horizontal pivot at its upper end at *e*, while its lower part is constantly drawn towards the right (in the direction of the arrow) by the metallic spring *g*. When, therefore, the instrument does not register the teeth of the wheel *b* do not bite in the endless screw, but this and the vertical axis are quite free, and revolve with the cups without any registration being made. The observer takes the instrument by the handle, with the thumb on the button *h*. At 0 seconds he pushes the button inwards, the arm *ef* with the three wheels is moved towards the vertical axis,

the teeth of the wheel *b* bite in the endless screw, *b*, *c* and *d* are moved, and the registration commences. The required time of 30 seconds being passed, the observer removes his thumb from *h*, the spring acts and removes *b* from the endless screw, and the registration stops.

The toothed wheel *d* serves two purposes. When registration stops, the wheel *b* bites into *d*, which acts as a stopper or break, and keeps the wheelwork steady, so that the reading of the dial may be made at any time or place afterwards. Turning the wheel *d*, which is done by means of a pinion on the back of the case enclosing the wheelwork, the observer can, without opening the case, turn the wheels *b*, *c* and *d*, and bring the index *i* to point to the zero of the dial.

The case covering the wheelwork has a door of metal in front, so that the works can easily be got at, and oiled when required. In the upper part of the door is a small glass window just sufficient to show the upper part of the dial *a* where the index marks off the number.

The bottom of the case has an opening just sufficient for the required movement of the arm *ef*. The upper part of the handle is of metal, and hollow, to admit the lower end of the arm *ef* and its movements.

The friction coefficient of the anemometer was determined several times. When the air was quite calm, the smoke from the funnel going straight aft, I observed the rate given by the anemometrical registration, and that of the ship shown by the logging machine: six different series of comparisons gave the mean result in metres

$$a = 1{\cdot}6 \pm 0{\cdot}06.$$

Adjusting the dial so that the index points to 1·6 before registration, and registering in 30 seconds, the observer can read at once the true velocity of the air as felt at the place of observation. In practice, I always had the index adjusted to zero, because it was impossible to know beforehand if the friction coefficient would remain unchanged.

The *logging machine* used in 1877 is an application of Pitot's tube. A tube, closed at the lower end, with a small hole on the forepart near this end, projected out from the ship's bottom near the keel. When the ship has no motion, the water in the tube stands at the same level as the sea outside the ship; but when the ship moves ahead, the water level rises in the tube to a height *h* determined by the equation

$$v = \sqrt{2gh},$$

in which *v* is the rate per second of the ship, and *g* the acceleration of gravity, *v*, *g* and *h* expressed in the same unit of length. The upper part of the tube was broader. On the surface of the water in it was a small float, from which a string was passed vertically and around a pulley, and at the other end of the string was a small weight passing along a scale, on which the weight gave the rate of the ship in nautical miles per hour. The arrangement was very convenient, and measured the rate with a precision quite as great as that with which the anemometer measured the velocity of the wind. It was due to the first lieutenant, Mr. M. Petersen.

The direction and velocity of the wind as felt or observed on board require a correction, being different from the true direction and velocity on account of the motion of the ship. This was made in the following manner:—The rate of the ship was reduced from miles per hour to metres per second by means of a table. The observed direction of the ship's head was corrected to true magnetic course by means of the table of deviation of the compass. With the same deviation the observed direction of the wind was corrected to true magnetic direction. A transparent paper was laid upon a printed form containing a series of equidistant circles, with radii drawn for each single degree, and equidistant vertical and horizontal lines. Fig. 3 shows such a

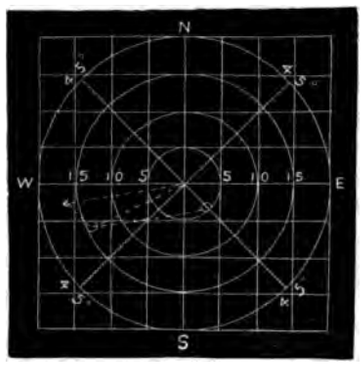


FIG. 3.

"rose" on a much-diminished scale. The North-South line was drawn on the transparent paper and the centre marked. From the centre was set out (1), the ship's true magnetic course and rate in metres per second, and (2), the wind's observed direction and velocity in the same manner, the distance between the concentric circles giving the scale. The outer point of the rate line was then transported to the centre, the North-South line on the transparent paper placed parallel to the North-South line on the rose (easily done by means of the vertical lines in the rose). The outer point of the wind-line marked then the true magnetic direction, and the true velocity of the wind. The magnetic direction was finally corrected to true direction by applying the magnetic declination of the place on the earth's surface where the observation was made. Of course, the geometrical construction could also be made with the observed directions of the ship's head and wind's direction, and finally the total compass error be applied as correction to obtain the true direction.

Example. 1876, August 18th, 8 a.m., observed ship's head S 33° E., Log 8·8 miles per hour, wind's direction S 78° W, anemometer 15·7 parts. The table of deviation gives deviated course S 33° E = true magnetic course S 45° E, deviation 12°, corrected magnetic wind direction, S (78°—12°) W or S 66° W Ship's rate 4·5 metres per second, anemometer corrected 14·8 metres per second. The construction (Fig. 3) gives true velocity

16·4, and magnetic direction S 81° W. The declination being 18° W., we get the true direction of the wind to be S 63° W or very nearly WSW.

The Form of clouds was reported according to Howard's nomenclature; the upper clouds being distinguished from the lower ones.

The Amount of cloud was noted on the scale 0 = clear sky, and 10 = overcast.

The Precipitation of rain, fog, dew, and its relative quantity or force, was noted in a special column.

The depth of rain fallen was measured with a rain-gauge hanging in gymbals on the after-deck near the rudder, two metres above the deck, and about five metres above the sea. It was constructed very like those used at the stations of the Danish Meteorological Institute, with the exception that the receiving surface was 225 square centimetres, and the upper margin bent conically inwards. The amount of the fallen rain was measured in a glass graduated to indicate millimetres.

The direction and amount of the sea disturbance were noted, the former in the same manner as the wind, the ship's motion being eliminated, and the latter by the scale 0 (calm) to 9 (the most disturbed sea).

The temperature of the surface of the sea.—A bucket of water was drawn from the sea close abaft the fore channels, and a thermometer, with a scale divided to 0°·2 C., was kept in the water until it had assumed its temperature, and was then read off.

The above-named meteorological observations were taken every hour when the expedition was at sea. The mate of the watch was observer, and the observations were regularly controlled by myself. The hours are ship's time, the clock being set to *apparent* time every day at noon.

The specific gravity of the sea water was taken with a hydrometer, and the observations made by the chemist of the expedition.

The Evaporation of sea water.—The atmometer was constructed after my own design, on the principle of the hydrometer. Fig. 4 represents the apparatus used in 1876, and Fig. 5 that used in 1877, both in a scale of one-tenth of the actual size. In Fig. 4 *b* is a buoy carrying a stem *c*, which again carries the evaporating vessel *a*. This vessel has cylindrical walls and a conical bottom. The open surface of the evaporating vessel is 225 square centimetres, the same as that of the rain-gauge. The buoy *b* is ballasted in its lower end with lead. It floats in sea water, contained in the large cylindrical vessel *dd*. The whole apparatus is made of japanned sheet-iron. When the evaporating vessel is empty the stem *c* and part of the buoy is above water, but when sea water is poured into it, *a*, the buoy sinks, and when the outer level has reached a mark on the stem the instrument is ready for work. The water in the evaporating vessel then stands one centimetre below the upper margin. As evaporation goes on the weight of the water in the vessel *a* diminishes, and the whole apparatus rises. In order to find how much water has evaporated, we pour from a graduated glass vessel, a burette, fresh water into *a* till we observe the outer level again at the mark on the stem. The evaporated water, which is fresh water, is then restored. The surface of *a*

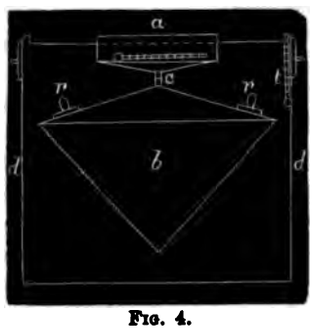


FIG. 4.

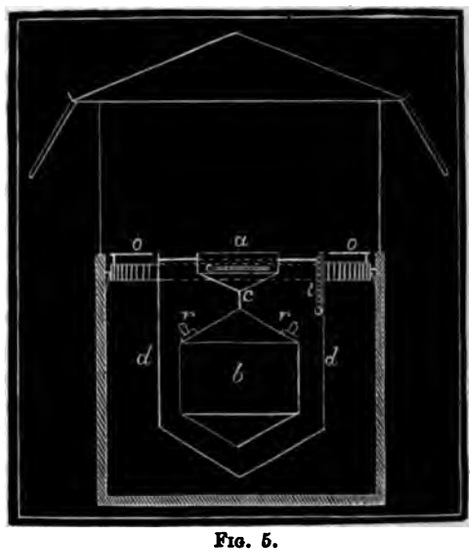


FIG. 5.

being 225 square centimetres, a quantity of 22·5 cubic centimetres of fresh water poured into *a* represents the height of 0·1 centimetre or one millimetre of evaporated water.

If the evaporating vessel were kept free above the outer water, surrounded by the air, it would be likely to take another temperature than that of the greater mass of water in the outer vessel *dd*, and be subject to larger variations of temperature during the day. It would also, in a rough sea, be more liable to throw the water out over the margin. I therefore made the following arrangement:—The instrument being adjusted to the mark, a leaden ring with two handles *rr* is laid upon the buoy; with this ballast the whole floating apparatus is so much depressed that the inner water level in *a* stands at the same height as the outer level. The evaporating surface of water is now surrounded by an evaporating surface of the same nature, level, temperature and density, the same as a corresponding surface of the sea. At the close of the experiment the ring *r* is removed, the buoy rises, and is brought down again to the mark by pouring fresh water into *a*.

The outer vessel *dd* is suspended in gimbals. At the bottom of the evaporating vessel there is a thermometer for ascertaining the temperature of the evaporating water. As the buoyancy of the outer water changes with its temperature, the buoy floating higher in cold water than in warm, the quantity of fresh water poured into the evaporating vessel requires a correction in order to represent the true quantity lost by evaporation, if the temperature of the outer water is different at the beginning and at the end of the experiment. How this correction is found will be shown farther on. A thermometer *t* is placed in the outer water, and is read at the beginning and end of each observation.

The atmometer was placed on the after-deck near the rudder. It was

here best kept out of harm's way. It had no cover, so that it received all the rain that fell in it. When the quantity of fallen rain was greater than that of the water evaporated, the buoy would, on the ring r being removed, remain depressed below the mark. I then took with a pipette a quantity of water out of the vessel a until the outer level reached the mark. This quantity of water gives (by its weight) the difference between the rainfall and the evaporation. The former being known from the observation of the rain-gauge, the latter can be ascertained. The quantity of water (being salt water) taken out by the pipette requires a correction, in order to represent the difference between the *fresh* rain water fallen and the *fresh* water evaporated. When the evaporation has been greater than the rainfall, the instrument is adjusted in the usual way, and the amount of evaporation is the sum of the water poured from the burette and the rain fallen.

During our cruize in 1876 the weather was generally very boisterous, and the rolling, and particularly the pitching, of the ship caused the water to be thrown out of the evaporating vessel so often that only few experiments on evaporation could be made. The vibration caused by the working of the steam winch had a similar effect to the roughness of the sea. When the sun was shining the outer vessel *dd* became so heated that the temperature of the whole apparatus rose many degrees above that of the sea and the air, and from the funnel flakes of soot fell on the evaporating water.

With the wish of getting rid of these inconveniences, I constructed a new apparatus (Fig. 5), which was used in 1877 and with very good success. The principle is the same as that in Fig. 4, but the dimensions are smaller. The evaporating vessel has a surface of 100 square centimetres, so that one cubic centimetre corresponds to the height of 0·1 millimetre of evaporated water. The stem is narrower, and the buoy of cylindro-conical form. The evaporating vessel is relatively deeper, and has lying on its bottom a grating of thin vertical metallic strips, whose object is to check the splashing of the water over the brim of the vessel. On this the inner thermometer is laid. The evaporating vessel and the stem are tinned and the buoy japanned. The movements of the outer vessel in the gimbals are more perfect. The whole apparatus is suspended in the interior of a wooden square box, and the upper opening between the outer swinging vessel and the wooden box is covered by an iron sheet cover *oo*, swinging with the outer ring of the gimbals. A metal roof, with four water tubes, resting on four thin iron pillars, covers the whole apparatus, and protects it from rain, soot, and other causes of injury to accuracy. In this apparatus the temperature did not rise much above that of the air or sea, and the observations could be made even in rather rough weather. It was placed on the after-deck at the side of the former, freely exposed to the wind. In the sequel, I shall call the old apparatus A, the new one B.

I will now investigate the different sources of error likely to influence the results obtained with the atmometer :—

1. *Error in the diameter of the evaporating vessel.*—Calling the radius r, a small error in it, dr, the surface O, a small error in it, dO, we have—

$$O = \pi r^2 \qquad dO = 2\pi r\, dr$$
$$\frac{dO}{O} = \frac{2\pi r\, dr}{\pi r^2} = \frac{2}{r}\, dr$$

In the atmometer A we have $O = 225$ ccm., $r = 84{\cdot}4$ mm. $\frac{dO}{O} = \frac{2}{84{\cdot}4} dr$.

Putting $dr = 0{\cdot}5$ mm., we get $\frac{dO}{O} = 0{\cdot}0118$, or 1·18 per cent. In the same ratio the height of evaporated water is changed. The greatest measured evaporation is a height of 6 mm. 6 mm. × 0·0118 gives 0·07 mm.

In the atmometer B we have $O = 100$ ccm., $r = 56{\cdot}4$ mm., $\frac{dO}{O} = \frac{2}{56{\cdot}4} dr$.

With $dr = 0{\cdot}5$ mm. we get $\frac{dO}{O} = 0{\cdot}0177$ or 1·77 per cent. 6 mm. × 0·0177 = 0·106 mm.

A precision of 0·1 mm. in the depth of the evaporated water is almost the limit attainable at sea. We observe that there may be an error of nearly a whole millimetre in the diameter of the evaporating vessel without this limit being reached in our experiments; the change of the diameter with temperature is consequently not at all appreciable.

2. *Error in the specific gravity of the water poured into the evaporating vessel from the burette.*—If the number of cubic centimetres of water poured out in the evaporating vessel to restore the evaporated water is to represent its weight in grammes, the water ought to be distilled water at a temperature of 4° C. Calling the specific gravity of distilled water, at 4° C, S_0 and of the water used in the experiment S, the number of cubic centimetres poured out c, the weight in grammes of the same water C_0, we have

$$\frac{C_0}{c} = \frac{S}{S_0}\,, \quad \frac{C_0 - c}{c} = \frac{S - S_0}{S_0}\,, \quad C_0 - c = c.\ \frac{S - S_0}{S_0} = c\left(\frac{S}{S_0} - 1\right).$$

In the atmometer B one cubic centimetre corresponds to a height of 0·1 mm. Putting $C_0 - c = \pm 1$, $c = 60$ ccm. (the maximum observed) we get

$$\frac{S}{S_0} = 1 \pm \frac{1}{60} = 1{\cdot}0166 \text{ or } 0{\cdot}9833$$

that is, the specific gravity of the water in the burette may be as high as 1·0166 or as low as 0·9833 in order to cause an error of 0·1 mm. in the height of evaporation. Fresh water at 20° C has a specific gravity of 0·9982. Common drinking water causes consequently no appreciable error, nor do errors in the division of the burette.

In the case that the rainfall in the open atmometer A is greater than the evaporation, and a portion of water must be taken out of the evaporating vessel to restore the equilibrium, this water is salt and has a higher specific gravity. Considering this to be 1·027 (a rather high value), the quantity of water taken up with the pipette 97 cmm. (as observed 1876, June 9), we get

$$C_0 - c = 97 \text{ ccm. } (1{\cdot}027 - 1) = 97 \times 0{\cdot}027 = 2{\cdot}62$$

2·62 ccm. correspond to a height of evaporation of $\frac{2{\cdot}62}{22{\cdot}5}$ or 0·12 mm. The correction is nearly on the limit of precision.

8. *The change of temperature of the water in which the buoy is floating.*—Let p be the weight of the buoy and its contents when it is adjusted to the mark on the stem, V_o the volume of the buoy below the mark at 0° C., S the specific gravity of the water in which the buoy floats (the outer water) at 0° C., S_t its specific gravity at $t°$ C, a the coefficient of linear expansion per 1° C. of the material of which the buoy is made, and x_t the difference in the weight of the buoy with contents at the temperature 0° and at $t°$, we have

$$V_o\, S_o = p$$
$$V_o\,(1 + 3at)\, S_t = p - x_t$$

By subtraction we get $V_o\,(S_o - (1 + 3at)\, S_t) = x_t$

and $$x_t = V_o\, S_o \left(1 - \frac{S_t}{S_o}(1 + 3at)\right).$$

The ratio $S_t : S_o$ is found from Hubbard's Tables of the volumes of sea water.* Calling the volume at 0° v_o, the volume at $t°$ v_t, we have

$$\frac{S_t}{S_o} = \frac{v_o}{v_t}$$

and $$x_t = V_o\, S_o \left(1 - \frac{v_o}{v_t}(1 + 3at)\right).$$

By the atmometer A V_o is 6560 cubic centimetres, and with a specific gravity S_o of 1·027 we get $S_o\, V_o$ like 6735 grammes. By the atmometer B we have $V_o = 2712$ ccm. and $V_o\, S_o = 2785$ gr. The coefficient of linear dilatation being for iron 0·0000122, we have $3a = 0{\cdot}0000366$. With these values we have

For atmometer A — $x_t = 6735 \left(1 - \frac{v_o}{v_t}(1 + 0{\cdot}0000366.\, t)\right)$

„ B — $x_t = 2785 \left(1 - \frac{v_o}{v_t}(1 + 0{\cdot}0000366.\, t)\right)$.

The following Table gives the value of x_t for all temperatures from 0° to 20° C.

t	A	B	t	A	B	t	A	B	t	A	B
0°	0·0	0·0	5°	1·1	0·5	10°	4·1	1·7	15°	9·2	3·8
1	0·1	0·0	6	1·6	0·7	11	5·0	2·0	16	10·5	4·3
2	0·2	0·1	7	2·2	0·9	12	5·9	2·4	17	11·9	4·9
3	0·4	0·2	8	2·8	1·1	13	7·1	2·9	18	13·3	5·5
4	0·7	0·3	9	3·4	1·4	14	8·2	3·4	19	14·9	6·2
5	1·1	0·5	10	4·1	1·7	15	9·2	3·8	20	16·4	6·8

For a certain temperature we have

$$\frac{dx_t}{x_t} = \frac{d\, S_o}{S_o} \text{ or } dx_t = x_t \frac{d\, S_o}{S_o}$$

Let S_o change from 1·027 to 1·020, or $d\, S_o$ be 0·007, we get $dx = x_t \frac{0{\cdot}007}{1{\cdot}027} = 0{\cdot}0068\, x_t$. The highest value of x_t in the Table is: for A, 16·4; for B, 6·8; 16·4 × 0·0068 is 0·11, and 6·8 × 0·0068 is 0·05. The

* 'Proceedings of the Royal Society,' Vol. xxiii., No. 160, page 305. 'Maury Sailing Directions,' 8th Ed. Vol. I. p. 237 et sqq.

Table is, therefore, sufficiently accurate within all limits of specific gravity found in the water of the ocean, and the more so as in the experiments there is only the question of differences between the values of x given in the Table.

When at the beginning of the experiment the buoy has been adjusted to the mark, the temperature of the outer water being t, and at the close of the experiment the same is effected, the temperature being t^1, by a weight of water poured into the evaporating vessels of f grammes, or a volume of f cubic centimetres of fresh water, then, if t^1 is greater than t, the buoy floats deeper at the end than at the beginning, and the total quantity of water evaporated is *greater* than f grammes or cubic centimetres. The difference between these two quantities, or the correction to be added to f, is the difference between the x_t corresponding to the temperature t^1 and the x_t corresponding to the temperature t. If t^1 is less than t, the buoy floats higher at the end, and requires, in order to be depressed to the mark, a greater quantity of water than that evaporated, and the correction is to be subtracted from f. Let *e.g.* the atmometer A at 9 a.m. be adjusted to the mark, the temperature of the outer water being 10°. The water is left evaporating till 9 p.m. The temperature of the outer water is then found to be 15°, and 95 cubic centimetres of fresh water are required to sink the buoy to the mark. In the Table we find for $t = 10°$, $x_t = 1{\cdot}7$; for $t = 15°$, $x_t = 8{\cdot}8$. Then the true quantity of water evaporated is $95 + (8{\cdot}8 - 1{\cdot}7)$, or $95 + 2{\cdot}1$, or $97{\cdot}1$ cubic centimetres. The surface of the evaporating vessel being 225 square centimetres, the height of water evaporated is $\frac{97{\cdot}1}{225}$ centimetres, or 4·31 millimetres in 12 hours. The average evaporation per hour is 0·36 millimetres.

The differences between the values of x for different temperatures can be determined by experiment, which I made in the following manner:—The evaporation vessel was kept dry; a small glass vessel was put into it, and it was besides loaded with dry weights, shot and sand, till the buoy was depressed to the mark. The temperature of the outer water was then at its maximum, and was noted; the water was then allowed to cool. At successive stages of cooling the temperature was read off and the buoy brought down to the mark again by pouring fresh water from a burette into the small glass vessel. After each such experiment the glass vessel was carefully dried. The number of cubic centimetres of water poured into the glass vessel is then equal to the difference between the x belonging to the initial temperature and the v belonging to the lower temperature corresponding to the experiment. I made two such series of experiments with both atmometers, with A in 1876 and with B in 1877, the first with B in Christiania, the last in Tromsö. The following table shows the results of the experiments and their comparison with the computed values:—

Christiania. cubic centimetres.				Tromsö. cubic centimetres.			
t	Obs.	Comp.	Diff.	t	Obs.	Comp.	Diff.
°				°			
15·0	0·0	0·0		8·7	0·0	0·0	
12·6	1·2	1·2	0·0	6·2	0·7	0·6	+0·1
11·9	1·5	1·4	+0·1	5·1	0·9	0·8	+0·1
11·6	1·6	1·6	0·0	4·6	0·4	0·9	—0·5
9·9	2·2	2·1	+0·1	1·9	1·1	1·2	—0·1
9·5	2·2	2·4	—0·2	1·7	0·8	1·2	—0·4

The differences between the observed and computed values are much below the limit of precision attainable on board ship at sea.

4. *During the evaporation the saltness of the evaporating water increases*, which circumstance tends to retard the evaporation. To show the effect of this I will take an example, the initial specific gravity of the water being 1·027: The volume of the water in the evaporating vessel of the atmometer A is 623 cubic centimetres, and its weight 630 × 1·027, or 640 grammes. To the specific gravity of 1·027 correspond (according to the tables given by Professor Karsten in Kiel) 3·54 per cent. of salt; 640 grammes of water contain therefore 22·65 grammes of salt. The greatest evaporation measured in one experiment is 125 cubic centimetres, or 125 grammes of fresh water. At the end of the experiment there was consequently 640—125, or 515 grammes of water in the vessel. In these 515 grammes of water the whole quantity of salt, 22·65 grammes, are contained, or the saltness is 4·40 per cent. The specific gravity has increased from 1·0270 to 1·0386.

In the atmometer B the experiment begins with a volume of water of 263 cubic centimetres or a weight of 270 grammes, which contain 9·56 grammes of salt, and the greatest evaporation measured is 60 cubic centimetres. At the end the vessel contains 270—60 or 210 grammes of water, which contain 9·56 grammes of salt or 4·55 per cent. The specific gravity is increased to 1·0847, a greater value than in the case above.

The rate of evaporation is, *cæteris paribus*, proportionate to the difference between the maximum tension of the aqueous vapour (E) over the evaporating fluid, and the tension (e) of the aqueous vapour present in the air. Let the quantity evaporated in the unit of time be f and a be a constant, we have

$$f = a\,(\mathrm{E}-e).$$

Supposing e to be constant, we have

$$\frac{df}{f} = \frac{d\mathrm{E}}{\mathrm{E}-e} \text{ or } df = f.\,\frac{d\mathrm{E}}{\mathrm{E}-e}$$

where df is the correction to be applied to f, when E gets the correction dE.

The tension E may, by Wüllner's law,* be put

$$\mathrm{E} = \mathrm{E}_0\left(1 - a\,\frac{y}{x}\right)$$

where E_0 is the maximum tension of the vapour over pure water, a a constant, (which for chloride of sodium is 0·601), y the quantity of salt and x the

* Poggendorff's Annalen, Bd. 103.

quantity of pure water. In our example we have the mean temperature of the evaporating water, 7°·6C., to which corresponds $E_o = 7{\cdot}80$mm., and the mean value of $e = 5{\cdot}15$mm., by the psychrometer. Further we have

	At the beginning.	At the end.
y =	9·56	9·56
x =	270—9·56=260·44	210—9·56=200·44
$\frac{y}{x}$ =	0· 0367	0· 0476
$a\frac{y}{x}$ =	0·02206	0·02861
$1-a\frac{y}{x}$ =	0·97794	0·97139
E =	7·62793	7·57684

The mean value of E during the experiment is, therefore, 7·60239, instead of the initial value, 7·62793. The correction to E is the difference, or — 0·02554, and we get

$$df = f.\ \frac{-0{\cdot}02554}{7{\cdot}60-5{\cdot}15} = -f.\ \frac{0{\cdot}02554}{2{\cdot}45} = -f.\ 0{\cdot}0104.$$

The correction becomes 1·04 per cent. of the rate of the evaporation, or as the total amount of this is, *cæteris paribus*, proportionate to the time, we get in our example $df = -60 \times 0{\cdot}0104$ ccm. $= -0{\cdot}624$ ccm. The whole correction due to the increased saltness of the evaporating water does not reach one cubic centimetre, and its effect is only a diminution of 0·06 mm. in the height of the evaporated water, a quantity generally below the precision attainable at sea. In regions where the evaporation is more rapid, the evaporating vessel requires a greater capacity, or the experiments must be made at shorter intervals.

In 1877 the two atmometers stood side by side, and I made some observations with both, in order to compare their results. The observations were taken generally at 9 a.m. and 9 p.m. The result was this:—

Sum of Hours.	Total height of water evaporated.		
	A	B	A—B
h.	mm.	mm.	mm.
76.08 day	13·74	13·12	+0·62
62.25 night	11·25	11·18	+0·07
23·00 day and night	3·15	3·67	—0·52
Total..161·33	28·14	27·97	+0·17

The two atmometers have, as will be observed, given almost the same amount of evaporation. This result will entitle the methods to a good deal of confidence. We may regard their results as a fair measure of the evaporation from their evaporating vessels. How far they represent the true evaporation from the surface of the sea is not so easy to determine.

The amount of evaporation depends on the temperature of the evaporating water, its saltness, the humidity of the air, the barometrical pressure, and

the velocity of the wind. In the atmometer the temperature of the water can scarcely be kept so low as the temperature of the surface of the sea, and the temperature of the air is also generally a little higher in the vicinity of the apparatus. The saltness is, practically, the same in both places, as the sea water in the atmometer is changed every day. The absolute humidity of the air may also be taken as the same, as well as the pressure; but the velocity of the wind may be different, firstly, because the ship which carries the atmometer is moving, and then because the wind has a freer movement over the surface of the sea than over the ship's deck. But the most perplexing circumstance is perhaps the disturbance of the surface of the sea by the waves, which not only gives it a greater surface, but also produces the spray, and thus gives the water an increased surface subject to evaporation, tending to disturb all our calculations. From this point of view I can only regard my measures of the evaporation of the sea water as a first approximation, which scarcely indicates the true value of the phenomenon. The values found may well be considered to represent the relative amount in different places and at different times, and it would be very interesting to compare observations made in other regions, *e.g.* in the tropical seas and in other seasons, with instruments of the same or a similar construction with mine. The atmosphere takes its vapour from the surface of the ocean to so great an extent, that it seems to me well worth while to examine the relations between the evaporation from the ocean and the quantity of aqueous vapour contained in the atmosphere.

It has been tried, with success it seems, by Professor Weilenmann in Zürich,* to calculate the amount of evaporation from the other meteorological elements. To check such a calculation for the oceans we require observations of the evaporation as well as of the other meteorological elements. In no part of the ocean are the last-named now so well known as in the Tropical part of the Atlantic, from which the labours of the Meteorological Office in London have given us such a great treasure of information. Would that the evaporation had been added to this, and we should have some further knowledge of the circulation of the water on the earth based upon real observation.

In the complete meteorological observations made on our expedition we have the necessary material for undertaking a calculation of the amount of evaporation from the corresponding meteorological factors. This will be done later, when the observations for 1877 have been fully reduced.

To these remarks I will add some preliminary results of my determinations of evaporation of the sea water in the summer of 1877, made with the new atmometer. It must be remarked that hardly any rain fell when we were at sea.

Of the water evaporated during 24 hours, 62 per cent. evaporated during daytime (9 a.m. to 9 p.m.) and 38 per cent. during night. On an average there evaporated a depth of 3·9 millimetres per 24 hours from the sea

* Zeitschrift der Oesterr. Gesellsch. für Meteorologie. 1877. Nos. 14 and 19.

between the parallels of 65° and 71° north lat. and Norway and Jan Mayen. Near the coast of Norway the evaporation rose in July to 5·9 millimetres per 24 hours. But in the polar current by Jan Mayen, where the weather was foggy and cold, the evaporation in 24 hours was only 0·8 millimetre. The velocity of the wind had always a very marked influence.

The formulæ for the diurnal periods of the pressure, temperature, humidity, and velocity of the air and the temperature of the surface of the sea having been computed, after Bessel's method, in 1876, I give the *computed* values, with maxima and minima, and their epochs, in the following table. The calculations have been made by Mr. A. Steen, first assistant at the Meteorological Institute. The calculations are based upon the observations of 31 days, divided in three periods, namely, June 28 to July 8, July 17 to 26, and August 4 to 13. No hourly observations were made in the intervening days, when the expedition was lying at Thorshavn (Färö) and at Reykjavik (Iceland).

It will be observed that the diurnal variations of all elements are very small compared with the variations on land stations. The curve of pressure shows the remarkable fact that the principal minimum occurs in the morning hours —a fact found also in other places of the sea. The vapour tension has the same period as at the continental and tropical stations, with a slight minimum at the warmest part of the day. This is not an apparent phenomenon, caused by the psychrometer, which gives a lower tension in a fresh wind, because the velocity of the wind has a minimum at the same time as the vapour tension. The diurnal change of the temperature of the sea surface is so slight that its amplitude is only 0°·1 C. The maximum and minimum show a retardation in time compared with those of the temperature of the air.

The diurnal periods here given belong to the region of the sea between Norway, the Färö Islands and Iceland, and the parallels of 62° and 66° north latitude, the summer (end of June to middle of August) during weather generally "overcast," "windy" and "wet."

POSTSCRIPT, *January 29th*, 1878.

The effect of the ship's change of position has been eliminated, so far as possible, by two circumstances:—1. That the ship's clock from which the hours for observation were taken was set to true local time each noon; and 2, that the change of position was first westwards and then eastwards back to the same meridian, which circumstance acts as a perfect compensation. It is further to be remarked that during very heavy weather the ship did not alter its position in any appreciable degree, that in working weather a good part of the day was spent in dredging and sounding, during which operations the ship was stationary for many hours. The mean rate westwards or eastwards was therefore slow.

I will also mention that in the computation of the diurnal variations

DIURNAL PERIOD.—Differences from Daily Mean.

Hours.	Barometer.		Temperature of the Air.		Vapour Tension.		Relative Humidity.	Velocity of Wind.		Temperature of Sea Surface.	
	mm.	In.	C.	F.	mm.	In.	per cent.	Meters in second	Miles per Hour.	C.	F.
			°	°						°	°
1 a.m.	—0·15	—0·0059	—0·29	—0·52	— 0·08	—0·0032	0·8	—0·48	—1·08	— 0·03	—0·05
2 ,,	—0·24	— ·0095	—0·31	— ·56	—0·09	— ·0035	0·8	—0·51	—1·14	—0·04	— ·07
3 ,,	—0·29	— ·0114	—0·34	— ·61	—0·10	— ·0039	0·7	—0·42	— 0·94	—0·05	— ·09
4 ,,	—0·27	— ·0063	—0·35	— ·63	—0·11	— ·0043	0·9	—0·26	— ·58	—0·05	— ·09
5 ,,	—0·19	— ·0075	—0·34	— ·61	—0·10	— ·0039	1·0	—0·14	— ·31	—0·05	— ·09
6 ,,	—0·09	— ·0035	— 0·28	— ·50	—0·09	— ·0035	0·9	—0·07	— ·16	—0·05	— ·09
7 ,,	0·00	·0000	—0·20	— ·36	—0·06	— ·0024	0·7	0·03	— ·07	—0·04	— ·07
8 ,,	0 06	·0024	—0·07	— ·13	—0·02	— ·0008	0·3	0·14	·31	—0·03	— ·05
9 ,,	0·09	·0035	0·07	·13	0·03	·0012	0·0	0·28	·63	—0·03	— ·05
10 ,,	0·13	·0051	0·21	·38	0·08	·0032	—0·5	0·36	·81	—0·02	— ·04
11 ,,	0·19	·0075	0·37	·67	0·11	·0043	—0·9	0·30	·67	—0·01	— ·02
Noon	0·25	·0099	0·46	·83	0·11	·0043	—1·5	0·18	·40	0·00	·00
1 p.m.	0·29	·0114	0·49	·88	0·10	·0039	—1·8	0·04	+ ·09	0·02	·04
2 ,,	0·28	·0110	0·47	·85	0·10	·0039	—1·7	—0·01	— ·04	0·03	·05
3 ,,	0·22	·0087	0·40	·72	0·11	·0042	—1·2	0·08	+ ·18	0·04	·07
4 ,,	0·14	·0055	0·33	·59	0·13	·0051	—0·6	0·19	·43	0.05	·09
5 ,,	0·05	·0020	0·25	·45	0·13	·0051	—0·2	0·27	·60	0·05	·09
6 ,,	—0·03	— ·0012	0·16	·29	0·09	·0035	0·0	0·29	·65	0·06	·11
7 ,,	—0·07	— ·0028	0·05	·09	0·04	·0016	0.0	0·22	·49	0·05	·09
8 ,,	—0·08	— ·0032	—0·08	— ·14	—0·03	— ·0012	0·0	0·16	·36	0·04	·07
9 ,,	—0·06	— ·0024	—0·19	— ·34	—0·07	— ·0028	0·2	0·08	·18	0·03	·05
10 ,,	—0·03	— ·0012	—0·28	— ·50	—0·09	— ·0035	0·5	—0·05	— ·11	0·01	·02
11 ,,	—0·03	— ·0012	—0·29	— ·52	—0·08	— ·0032	0·8	—0·20	— ·45	0·00	·00
Midnt.	—0·09	—0·0055	—0·29	—0·52	—0·08	—0·0032	0·9	—0·35	—0·78	—0·02	— ·04
Max. ..	+0·29	+0·0114	+0·49	+0·88	+ 0·11	+0·0043	+1·0	+0·36	+0·81	+0·06	+0·11
	h. m. 1 19 p.m.		h. m. 1 0 p.m.		h. m. 11 39 p.m.		h. m. 5 0 a.m.	h. m. 10 6 a.m.		h. m. 5 32 p.m.	
Max. ..	—0·03	—0·0112	....		+0·13	+0·0051	....	+0·29	+0·65	....	
	h. m. 10 40 p.m.				h. m. 4 32 p.m.			h. m. 5 32 p.m.			
Min. ..	—0·30	—0·0118	—0·35	—0·63	—0·11	—0·0043	—1·8	—0·52	—1·16	—0·05	—0·09
	h. m. 3 16 a.m.		h. m. 4 12 a.m.		h. m. 3 50 a.m.		h. m. 1 15 p.m.	h. m. 1 32 a.m.		h. m. 4 28 a.m.	
Min. ..	—0·09	—0·0034	....		+0·10	—0·0039	....	—0·01	—0·04	....	
	h. m. 7 44 p.m.				h. m. 1 50 p.m.			h. m. 1 48 p.m.			
Mean	753·06	29·6448	10·52	50·94	8·74	03·442	92·2	9·85	20·2	10·33	50·59
	h. m. 7 1 a.m. 5 36 p.m.		h. m. 8 30 a.m. 7 24 p.m.		h. m. 8 18 a.m. 7 35 p.m.		h. m. 9 10 a.m. 6 20 p.m.	h. m. 6 43 a.m. 9 41 p.m.		h. m. 11 20 a.m. 10 50 p.m.	
Empl. *	0·59 ±0·02	0·0232 ±0·0008	0·84 ±0·03	1·51 ±0·05	0· 24 ±0·022	0·0094 ±0·0009	2· 8 ±0·30	0·88 ±0·12	1·97 ±0·27	0·11 ±0·03	0·20 ±0·05

* is the probable error of a single value of the respective elements as determined by observation for any hour of the diurnal period.

METEOROLOGICAL OBSERVATIONS, 1876.—June 28 to July 8, July 17 to July 26, August 4 to August 13.

MEAN OF OBSERVED VALUES.

Hour.	Barometer, reduced to 0° C.	Thermometer.	Force of Vapour.	Relative Humidity.	Velocity of Wind, meter per second.	Temperature of the Sea.
	mm.	C.	mm.			
1 a.m.	752·95	10·23	8·67	93·0	9·48	10·34
2 „	52·82	10·16	8·66	93·4	9·50	10·29
3 „	52·75	10·16	8·61	92·7	9·33	10·29
4 „	52·77	10·18	8·62	92·8	9·55	10·22
5 „	52·86	10·17	8·67	93·5	9·71	10·21
6 „ ...	53·00	10·19	8·64	93·1	9·76	10·28
7 „ ...	53·01	10·32	8·69	92·9	10·03	10·35
8 „	53·11	10·40	8·72	92·5	9·95	10·36
9 „ ...	53·14	10·60	8·76	92·0	10·00	10·25
10 „	53·23	10·74	8·81	91·6	10·29	10·35
11 „	53·21	10·90	8·91	91·6	10·14	10·26
Mid-day ..	53·30	10·90	8·79	90·5	9·97	10·31
1 p.m.	53·37	11·04	8·87	90·7	9·90	10·34
2 „	53·34	11·07	8·79	89·5	9·90	10·43
3 „	53·28	10·88	8·91	92·0	9·77	10·37
4 „ ...	53·21	10·87	8·86	91·5	10·12	10·34
5 „	53·10	10·77	8·83	91·7	10·15	10·39
6 „	53·06	10·74	8·84	92·1	10·07	10·38
7 „	52·99	10·59	8·79	92·4	10·20	10·44
8 „ ...	52·99	10·47	8·71	92·2	9·67	10·35
9 „	53·00	10·36	8·67	92·5	10·16	10·36
10 „	53·04	10·28	8·65	92·7	10·02	10·27
11 „	53·05	10·27	8·65	92·9	9·47	10·32
Midnight ..	52·95	10·25	8·66	93·0	9·30	10·37
Mean	753·064	10·52	8·74	92·20	9·852	10·33

corrections* have been applied for the change of the absolute values of each respective element from the commencement to the end of each period. The application of these corrections improved the curves in an appreciable way.

DISCUSSION.

Mr. LAUGHTON said that the instrument Professor Mohn had used for determining the speed of the ship, was invented many years ago by a clergyman, well known in the engineering world, the Rev. W. Berthon. The idea of the instrument is very pretty, but, in practice, it has not won favour. The pipe projecting from the bottom has been found liable to be torn off, by fouling the buoy rope, when the ship is at anchor in a tide way; and, in big ships at least, the measurements of speed have not proved satisfactory; it is suspected that a good deal of water hangs, by friction, to the pipe and the keel, and takes off a part of the

* This is a correction for the change due to lapse of time, as also change of ship's position. The correction referred to has evidently been applied to the means in the table marked "mean of observed values," so that the absolute means of observed values are not given. [Ed.]

pressure which should affect the register; possibly, in a small vessel, like that in which Professor Mohn had observed, this source of error might be less important.

Mr. SYMONS said that a similar instrument had been described at the Edinburgh Meeting of the British Association (1871), under the name of Fletcher's Rhysimeter, but, owing to the possibility of a barnacle getting on the pipe and stopping up the hole (when, of course, the apparatus would not be of much use), and other objections, it was thought that the Rhysimeter was not practicable. He was very glad to see that a number of simultaneous observations had been made with a mercurial barometer and an aneroid; but, as regarded hygrometry, he thought that it would have been far preferable if a Regnault's, or some other Dew-point Hygrometer, had been used instead of a Daniell's, as the latter instrument was much inferior, very difficult to read, and, he might almost say, a thing of the past. With regard to the Atmometers, he believed that the results would be seriously impaired by the insplashing of water when exposed to rain, and, when sheltered, other sources of error arose—the determination of the amount of evaporation was terribly difficult.

Mr. GREAVES expressed great pleasure at the determined endeavour of Professor Mohn to acquire a more perfect knowledge of the rate and extent of evaporation. The courage that carried on such investigations on board ship at sea was most praiseworthy. He also commended the determination to surround the measuring pan with a larger vessel, similarly filled, and the endeavour to maintain equal influences acting on both vessels. He hoped that models, or at least full-sized drawings, of the atmometers could be procured. The perpetual log invented by Rev. W. Berthon appeared to be the instrument described in the paper as used for determination of the ship's way, a full description of which appeared in the Nautical Magazine for 1850. A log on this principle was fixed and used in the "Courier" Channel Island steamer, and in some ships in the Navy. He had seen and examined one in 1850 in the "Bee," steam tender to the "Excellent," but presumed that some uncertainty must have attended the indications as the use of it had not been extended. The principle, however, deserved trial and encouragement, the perpetual indication being, if only a reasonable approximation, a very great point to acquire.

Mr. FIELD agreed with Mr. Greaves, that it was very desirable that models of the Atmometers should be sent over. The results should be received with great caution, as the Atmometers were so small, only about five inches in diameter. It was stated that the observations from the sheltered Atmometer agreed with those from the unsheltered one. This, in his opinion, instead of confirming the accuracy of the results, threw great doubt upon them, as the comparative experiments he had made proved that the evaporation from a sheltered atmometer differed greatly from that from one which was freely exposed to the sun and air. The instruments might very probably give the evaporation correctly from themselves, but he doubted extremely whether they could be taken as giving the evaporation from the sea.

Mr. STRACHAN said that if Professor Mohn's statement was correct respecting the "pumping" of the barometer, there must have been something wrong in the verification of the instrument, which was done at the Kew Observatory, the most valuable part of the test being as to its liability to "pumping." It was a departure from the usual practice, not apparently judicious, to employ a screen within a screen for shading the thermometers, and placing them about fifteen feet instead of four feet from the deck. The psychrometer observations made by so careful an observer should be received with considerable interest, because the wet-bulb thermometer was exceedingly difficult to manage in such low temperatures, and no good and reliable observations of this kind had been made in high latitudes; first, because of the instrumental difficulty, there being no thermometers hitherto used absolutely correct below the freezing point, though the smallest part of a degree at the low range told upon the results deduced; and, secondly, because the vapour tension curve for low temperatures is uncertain, and, consequently, the humidity, dew-point, &c., partake of the uncertainty. As to Daniell's hygrometer, it was absurd to suppose that so sluggish an instrument could be relied upon in low temperatures. With respect to evaporation from sea water, Professor Mohn had undertaken a most desperate investigation, beset with difficulties. His atmometer, the only novelty described in the memoir, was

indeed, in principle, the same as Babington's. It did not impress him with any confidence that it would solve the problem of evaporation, nevertheless the observations would deserve attention. It was stated that the diurnal curves had been deduced from Bessel's formula; but, since the observations had been stated to have been made hourly, it did not appear that Bessel's formula was wanted in the matter at all. For his own part he must say that he believed the observations taken in British ships would compare favourably with any others, but the evil was that, although expeditions were organised for scientific purposes, yet the results were suffered to remain undiscussed for years. This was the case with Sir James Ross's expedition to the Antarctic, and numerous expeditions to Arctic regions. Great care was usually taken in preparing instruments, &c., but it appeared to be nobody's business to examine them on return, correct the observations, reduce and discuss them. He thought that the Royal, the Astronomical, the Meteorological, and other Societies, should not only make it a duty to originate such expeditions, but also to see that their ulterior objects were properly carried out, then there would be a chance of some useful results for the public money.

Mr. C. HARDING said that the details of the construction and exposure of instruments added much to the value of the Paper. He, however, considered that too little had been said of the method followed in the discussion of the observations. He thought the barometer curve peculiar, and that too much reliance should not be attached to the results shown ; the period was too short, being only 31 days. He wished to know whether in the discussion of the observations allowance had been made for the effect of the ship's progress—the ship being a steamer, might have run rapidly from an area of low pressure to one of high, or *vice versâ ;* in either case she would cut out for herself a range of the barometer which might seriously interfere with the ordinary diurnal range. He also thought that if the actual observations themselves were not published, the ordinary means should be given.

REPORT ON THE PHENOLOGICAL OBSERVATIONS FOR THE YEAR 1877. By the Rev. T. A. PRESTON, M.A.

[Read December 19th, 1877.]

RETURNS have been furnished from the following places:—

I. Babbicombe, Devon.	E. E. Glyde, F.M.S.
II. Trusham, Devon.	Rev. W. Moyle Rogers.
III. Yeovil, Somerset.	Rev. J. Sowerby.
IV. Salisbury, Wilts.	W. Hussey.
V. Strathfield Turgiss, Hants.	Rev. C. H. Griffith, F.M.S.
VI. Isleworth, Middlesex.	Miss E. A. Ormerod, F.M.S.
VII. Marlborough, Wilts.	Rev. T. A. Preston, M.A., F.M.S.
VIII. Addington, Buckingham.	John Mathison.
IX. Watford, Hertford.	John Hopkinson, F.L.S., F.M.S.
X. Maldon, Essex.	E. A. Fitch.
XI. Ware, Hertford.	Lieut. R. B. Croft, F.L.S.
XII. Cardington, Bedford.	J. McLaren, F.M.S.
XIII. Bishop Frome, Hereford.	Rev. H. L. Graham.
XIV. Churchstoke, Montgomery.	P. Wright, F.C.S., F.M.S.
XV. Great Cotes, Lincoln.	J. Cordeaux, B.A.
XVI. Killingholme, Lincoln.	Rev. J. Byron, M.A., F.M.S.
XVII. Llandudno, Carnarvon.	J. Nicol, M.D., F.M.S.

These returns, though not equal to those supplied last year as regards numbers, are far more satisfactory as regards details; many of the observers having evidently entered into the spirit of the inquiry. It is unfortunate that our northern observers have ceased sending records, the additions to the list being almost entirely from the southern parts of England, and only seven of the original observers have sent in any returns for this year.

The request for specimens has been very slightly attended to; observers may have imagined that these were asked for in order to make sure that they had observed the right plants, and therefore, having proved once that they were correct, there was no need to send specimens in future. The great use made of the specimens last year would, it was hoped, have shown that their value was of far greater extent than this, but this appears not to have been the case. I can only repeat the request, that specimens may be sent in future.

In drawing up the first table, the same rules have been observed as on former occasions, only that in almost every instance where (?) has been inserted, the actual words of the observer have been given in the "notes on the several species," and an "n" has been put wherever any note or remark has been given in the original observations.

A second table has been given this year, comparing the dates of previous years as far as it has been possible to obtain them; and the "notes" have been drawn up from a comparison of the two tables.

From the first table may be gathered the difference of climate between two stations. As a rule, the same order of flowering may be observed this year as in 1876, viz. that plants came into flower first in the SW of England, at Trusham, and then in regular order to the north of Lincolnshire, at Great Cotes, where plants were generally latest in coming into flower. Isleworth seems to be an unusually backward locality; the dates given may be relied on, as the observer is extremely accurate and careful; of course there are exceptions, but the more important ones will be mentioned in the "notes."

From the second table may be deduced the general state of the weather, as regards temperature, and to a certain extent moisture. There is no doubt but that damp acts more powerfully than cold in retarding the flowering of some plants, and this has been particularly evident this year. Nurserymen were complaining of the lateness of the season in April, though by that time there had been but very little frost. The previous November and December had been unusually mild, and the great complaint in many places was that "things were coming on too fast." "Many plants came early into flower," was the remark from Addington in January, "vegetation unusually and abnormally forward" at Great Cotes in February. This mild weather lasted till the end of February, when a very cold period set in; all plants, therefore, which came into flower before that time were more advanced than usual, but during March, very slight progress indeed was made; "progress of Sloe, Coltsfoot and Sallow remarkably slow," is the remark from Maldon. At Marlborough, 5 species of wild plants came into flower in January, 17 in February, but only 9 during March, a most unusually small number. On

TABLE I.

No.	Plant.	II. Trusham.	III. Yeovil.	IV. Salisbury.	V. Strathfield Turgiss.	VI. Isleworth.	VII. Marlborough.	VIII. Addington.	XII. Cardington	XIII. Bishop Frome.	XIV. Churchstoke.	XV. Great Cotes.
1	ANEMONE NEMOROSA	Mar. 19 (?)	March 3	n	March 15	Mar. 26 (?)	March 14	March 28	March 27	Mar. 17 (?)	March 25	April 1
2	RANUNCULUS FICARIA	Jan. 11	Jan. 9	Jan. 20	....	Feb. 19	Jan. 19	Jan. 27 (?)	Feb. 8	Feb. 13 (?)	Feb. 17	March 8
3	*Ranunculus acris*	May 17	April 30	April 21	....	April 26	April 24	....	Feb. 16	May 17 (?)	May 12	May 17
4	CALTHA PALUSTRIS	March 12	Feb. 9	Feb. 24	Feb. 16	March 31	Feb. 14	April 5	Feb. 18	Mar. 8 (?)	April 2	March 30
5	*Papaver Rhœas*.....	June 3	....	n	....	June 6 (?)	June 15	....	June 13	....	June 13	....
6	*Cardamine hirsuta*	n	Feb. 2	....	....	April 23	Feb. 14	....	Feb. 18	April 13 (?)	March 20	....
7	*Cardamine pratensis*.....	March 15	Mar. 14	April 2	April 13	March 31	April 1	May 3	April 14	April 18 (?)	April 26	April 12
8	*Draba verna*	Feb. 14 (?)	Dec. 15, '76	Feb. 4	....	Feb. 8 (?)	Feb. 18	March 11	Jan. 27	....	n	....
9	*Viola odorata*	Feb. 15 (?)	Feb. 10	Feb. 14	Jan. 4	Mar. 16 (?)	Feb. 25	Feb. 16	Feb. 18	Feb. 19	Jan. 20	Feb. 17 (?)
10	*Polygala vulgaris*	March 22	May 25	April 23	.....	....	May 31	....	June 10	June 7	June 5 (?)	....
11	*Lychnis Flos-cuculi*	May 15	May 30	June 4	May 25	June 2	June 10	June 5	June 8	June 9	June 13	June 5
12	*Stellaria Holostea*.....	Feb. 15	Feb. 14	March 23	March 20	March 27	March 26	....	April 23	Mar. 14 (?)	April 4	April 8
13	MALVA SYLVESTRIS	June 12	....	June 15	June 21	June 12	June 14	June 24	June 16	June 28	June 14	June 21
14	*Hypericum tetrapterum*	July 10	....	July 16	....	July 28 (?)	July 13	....	....	. ..	....	July 15
15	*Hypericum pulchrum*	June 22	....	June 26	....	June 28 (?)	July 4	....	June 23	....	....	July 19 (?)
16	GERANIUM ROBERTIANUM	Feb. 10	May 11	April 30	Feb. 11	May 21	May 19	May 24	May 24	May 20	May 22	May 31
17	TRIFOLIUM REPENS	May 25	May 18	June 12	....	June 10	June 2	June 26	June 8	May 29 (?)	June 7	....
18	*Lotus corniculatus*	May 25	May 25	June 7	....	June 5	June 5	....	June 7	(June 8)	June 7	June 12
19	*Vicia Cracca*....	June 27	...	June 21	....	. ..	June 23	....	June 20	....	....	June 26
20	*Vicia sepium*	April 23 (?)	April 23	April 30	....	June 22	May 15	....	May 19	May 17 (?)	May 19	....
21	*Lathyrus pratensis*	June 8 (?)	....	June 16	....	June 15	June 16	....	June 14	....	June 16 (?)	June 21
22	PRUNUS SPINOSA	Feb. 19 (?)	March 6	Feb. 5	....	March 3	March 24	March 20	Feb. 17	April 2	March 18	April 2
23	*Spiræa Ulmaria*	June 19	....	June 18	June 22	June 24	June 22	June 25	June 24	June 21	June 30	July 2
24	*Potentilla anserina*	May 15 (?)	May 21	n	....	June 12	May 26	....	May 25	June 21	June 8	June 2
25	*Potentilla Fragariastrum*.....	Jan. 9	Dec. '76	Feb. 15	Jan. 19	March 22	Feb. 11	....	Feb. 19	Feb. 4 (?)	Feb. 1	April 8
26	*Rosa canina*	June 4	....	June 14	June 9	June 15	June 13	June 7	June 14	June 15 (?)	June 13	June 21
27	*Epilobium hirsutum*	....	....	July 17	....	....	July 23 (?)	....	July 9	July 21 (?)	....	July 16
28	*Epilobium montanum*	June 19	....	June 26	....	June 16	June 14	....	June 19	June 23 (?)	June 20	....
29	*Angelica sylvestris*	July 26 (?)	....	July 29 (?)	Aug. 10	July 24	July 28	....	July 26	....	....	....
30	*Anthriscus sylvestris*.....	April 10 (?)	Feb. 9	April 6	April 24	April 9	April 1	May 4	April 14	April 22 (?)	April 19	....
31	HEDERA HELIX.....	Sep. 25	....	Sept. 14	Sept. 29	Sept. 19	Oct. 14	....	Sept. 8	....	....	....
32	*Galium Aparine*	May 10	May 12	May 31	n	May 25	May 15	May 10	May 24	....	June 8	June 5
33	*Galium verum*	July 2	....	June 30	....	July 2 (?)	June 27	June 26	June 29	....	....	July 9
34	*Dipsacus sylvestris*	Aug. 2	....	July 25	Aug. 18	....	....	....	July 21	....	....	Aug. 7
35	*Scabiosa succisa*	....	....	Aug. 9	June 22	Aug. 23 (?)	....	....	....	Aug. 21	....	....

TABLE I.—*Continued.*

No.	Plant.	II. Trusham.	III. Yeovil.	IV. Salisbury.	V. Strathfield Turgiss.	VI. Isleworth.	VII. Marlborough.	VIII. Addington.	XII. Cardington	XIII. Bishop Frome.	XIV. Churchstoke.	XV. Great Cotes.
37	TUSSILAGO FARFARA	Feb. 19 (?)	Feb. 14	Mar. 21 (?)	May 5	Feb. 21	Feb. 14	Feb. 11 (?)	Feb. 11	Mar. 5 (?)	Feb. 6	Feb. 14
38	ACHILLEA MILLEFOLIUM	June 26	....	June 13	....	....	June 16	...	July 6	.. .	....	July 8
39	*Chrysanthemum Leucanthemum*	May 2	....	June 1	May 12	June 1	June 7	June 5	May 14	June 6	May 31	.. .
40	*Artemisia vulgaris*	Aug. 1	....	July 24	Aug. 2	July 31 (?)	....	....	Aug. 2	....	....	....
41	*Senecio Jacobæa*	July 2	....	July 5	....	June 24 (?)	June 19	.. .	July 5	....	....	July 19
42	CENTAUREA NIGRA	June 19	....	June 26	....	June 24 (?)	June 28	....	June 21	June 27	....	July 9
43	*Carduus lanceolatus*	July 12 (?)	....	July 5	....	July 10	July 13	....	July 17	....	....	July 10
44	*Carduus arvensis*	July 8	....	June 30	....	July 3	July 4	....	July 6	....	....	June 27
45	*Sonchus arvensis*	July 21	....	....	Aug. 14	July 20	July 25 (?)	....	July 14	....	June 14	July 18
46	*Hieracium Pilosella*	May 20	May 18	May 24	....	May 30 (?)	May 15	June 7	May 28	....	May 30 (?)	..
47	CAMPANULA ROTUNDIFOLIA	....	....	July 7	....	July 24 (?)	July 12	....	....	....	....	July 19
48	*Gentiana campestris*	....	....	....	Aug. 8	....	....	....	...	....	....	...
49	CONVOLVULUS SEPIUM	July 10	....	July 7	July 18	July 4	July 25	.. .	July 17	....	....	Aug. 6
50	*Symphytum officinale*	May 15 (?)	May 5	April 19	....	May 22 (?)	April 24	....	May 13	....	....	....
51	*Pedicularis sylvatica*	May 15 (?)	April 23	n	....	....	May 19	....	....	May 13	April 23	....
52	*Veronica Chamædrys*	April 17	March 17	April 7	March 19	April 21	April 24 (?)	....	May 1	May 2 (?)	May 15	....
53	*Veronica hederifolia*	n	Dec. '76	....	....	n	n	n	Feb. 3	....	April 1	....
54	*Mentha aquatica*	....	....	July 31	Aug. 5	Aug. 1 (?)	....	....	Aug. 2	....	....	....
55	*Thymus Serpyllum*	July 2 (?)	....	June 12	....	....	June 13	....	....	....	June 13	July 14 (?)
56	*Prunella vulgaris*	June 16	....	June 18	....	June 28 (?)	June 22	June 25	June 14	June 20	June 24	....
57	*Nepeta Glechoma*	Feb. 28 (?)	March 10	March 16	....	April 11	n	April 3 (?)	April 3	April 8 (?)	April 1	April 12
58	*Galeopsis Tetrahit*	June 22	....	....	....	July 14 (?)	July 25	....	July 7	....	....	....
59	*Stachys sylvatica*	June 17	....	June 18	....	June 17	June 22	....	June 18	June 21	June 25	....
60	*Ajuga reptans*	May 3	April 13	n	....	May 13	May 8	April 30	May 12	May 4	May 18	May 24 (?)
61	PRIMULA VERIS	....	March 31	Mar. 29 (?)	....	April 17	April 7	March 26	April 4	March 3	April 5	March 28
62	*Plantago lanceolata*	n	April 9	....	....	April 30	April 24	May 8	April 21	...	May 24 (?)	....
63	*Mercurialis perennis*	Feb. 10	Feb. 6	Jan. 15	Feb. 9	....	Jan. 25	....	Feb. 5	Feb. 3	Feb. 1	....
64	*Ulmus montana*	Feb. 10 (?)	Feb. 14 (?)	....	April 30	Feb. 23	Feb. 27	n	Feb. 25	.. .	March 5	....
65	*Salix caprea*	n	Feb. 16	n	n	....	Feb. 17	Feb. 26	Feb. 19	n	March 3	March 27
66	*Corylus Avellana*	n	Jan. 9	Jan. 2	Jan. 9	Jan. 28	Jan. 15 (?)	Jan. 8 (?)	Jan. 15	Jan. 9	Jan. 13 (?)	....
67	*Orchis maculata*	....	....	June 8	....	....	June 10	May 28	June 10	May 29	May 31	June 14
68	*Iris Pseud-acorus*	May 30	....	....	....	June 14	June 14	June 14	June 21	....	June 14	June 15
69	*Narcissus Pseudo-narcissus*	Feb. 11 (?)	March 6	(Feb. 13)	Feb. 24	March 6	Feb. 14	March 6	March 15	....	Feb. 28	....
70	*Galanthus nivalis*	....	Jan. 23	Jan. 16 (?)	Jan. 18	Jan. 19	Jan. 21	Jan. 8 (?)	Jan. 11	....	Jan. 18 (?)	Jan. 20
71	*Endymion nutans*	April 17	April 9	April 9	April 18	April 17	April 10	....	April 23	April 30 (?)	April 28	May 3

TABLE II.

No. and Name.	Year.	Yeovil. III.	Strathfield Turgiss. V.	Isleworth. VI.	Marlborough. VII.	Cardington XII.	Great Cotes. XV.
70. *Galanthus nivalis* (Snowdrop)	1875	Jan. 26	Jan. 2 (?)	....	Jan. 15	....	....
	1876	Feb. 19 (?)	Jan. 31	Jan. 30 (?)	Jan. 30	Jan. 28 (?)	Feb. 1
	1877	Jan. 23	Jan. 18	Jan. 19	Jan. 21	Jan. 11	Jan. 20
66. *Corylus Avellana* (Hazel)	1875	Jan. 16	Jan. 5	....	Jan. 18	....	....
	1876	Jan. 28	Jan. 6	....	Jan. 23	Jan. 29	....
	1877	Jan. 9	Jan. 9	Jan. 28	Jan. 15 (?)	Jan. 15	....
2. RANUNCULUS FICARIA (Pilewort)..	1875	Jan. 16	Feb. 9 (?)	April 5 (?)	Feb. 1	April 5	March 30
	1876	Feb. 19	Feb. 8	March 2	Feb. 15	Feb. 19	March 13
	1877	Jan. 9	....	Feb. 19	Jan. 19	Feb. 8	March 8
63. *Mercurialis perennis* (Dog's Mercury)	1875	Jan. 30	April 4	....	March 5	Mrch. 23 (?)	....
	1876	Feb. 22	March 14	....	Feb. 29	Feb. 24	April 7
	1877	Feb. 6	Feb. 9	....	Jan. 25	Feb. 5	....
37. TUSSILAGO FARFARA (Coltsfoot) ..	1875	Mar. 13 (?)	....	April 9 (?)	March 10	Mrch. 23 (?)	March 15
	1876	Feb. 22	Feb. 21 (?)	March 14	Feb. 29	Feb. 26	March 13
	1877	Jan. 14	May 5	Feb. 21	Feb. 14	Feb. 11	Feb. 14
25. *Potentilla Fragariastrum* (Barren Strawberry)	1875	....	Jan. 27 (?)	April 13 (?)	March 5	....	....
	1876	Feb. 5	Feb. 23	....	Feb. 28	March 9	....
	1877	All the Year	Jan. 19	March 22	Feb. 11	Feb. 19	April 8
9. *Viola odorata* (Sweet Violet) ..	1875	Jan. 28	Jan. 23	...	March 13	Mrch. 22 (?)	March 9
	1876	Feb. 8	Jan. 8	Feb. 5	March 2	March 2	March 4
	1877	Feb. 10	Jan. 4	Mar. 16 (?)	Feb. 25	Feb. 18	Feb. 17 (?)
65. *Salix caprea* (Great Sallow) ..	1875	March 10	March 6 (?)	....	March 14	April 1 (?)	Mar. 17 (?)
	1876	March 4	....	....	March 1	March 23	March 21
	1877	Feb. 16	....	....	Feb. 8	....	March 30
69. *Narcissus Pseudo-narcissus* (Daffodil)	1875	April 3	March 18(?)	....	March 23	Mrch. 23 (?)	....
	1876	March 10	March 7	March 14	Feb. 29	March 15	....
	1877	March 6	Feb. 24	March 6	Feb. 14	March 15	....
64. *Ulmus montana* (Wych Elm)	1875	March 10	(March 11)	....	March 9	Mrch. 26 (?)	....
	1876	Feb. 28	....	Mar 11 (?)	Feb. 28	March 7	....
	1877	Feb. 14 (?)	April 30	Feb. 23	Feb. 27	Feb. 25	....
8. *Draba verna* (Whitlow Grass)	1875	....	....	April 2 (?)	March 26	April,5	....
	1876	...	....	March 8	Feb. 27	Feb. 22	....
	1877	All the Year	....	Feb. 8 (?)	Feb. 18	Jan. 27	....
1. ANEMONE NEMOROSA (Wood Anemone)	1875	April 2	Mch. 21 (?)	....	March 17	April 4	April 4
	1876	March 17	March 24	Mar. 31 (?)	March 2	March 28	April 1
	1877	March 3	March 15	Mar. 26 (?)	March 14	March 27	April 1
4. CALTHA PALUSTRIS (Marsh Marigold)	1875	March 17	....	....	March 27	April 25	April 22
	1876	Feb. 9	March 14	March 30	Feb. 28	April 3	March 7
	1877	Feb. 9	Feb. 16	March 31	Feb. 14	Feb. 18	March 30
57. *Nepeta Glechoma* (Ground Ivy) ...	1875	March 29	....	....	May 3	April 27	April 14
	1876	March 16	March 30	April 7	April 1	April 4	April 12
	1877	March 10	....	April 11	n	April 3	April 12
22. PRUNUS SPINOSA (Blackthorn)	1875	March 31	Mch. 30 (?)	April 16	April 12	April 16	April 11 (?)
	1876	April 4	April 4	April 4	April 6	April 3	April 8
	1877	March 6	.....	March 3	March 24	Feb. 17	April 2
61. PRIMULA VERIS (Cowslip)	1875	April 2	April 1	April 23	April 19 (?)	April 10 (?)	April 12
	1876	March 25	April 3	April 24	April 16	April 6	April 5
	1877	March 31	....	April 17	April 7	April 4	March 28
30. *Anthriscus sylvestris* (Cowchervil)	1875	Feb. 2	....	....	April 19	May 5	....
	1876	March 17	....	April 17	April 26	April 27	....
	1877	Feb. 9	April 24	April 9	April 1	April 14	....
7. *Cardamine pratensis* (Cuckoo-flower)	1875	April 1	April 14 (?)	....	April 26	April 25	April 24
	1876	April 8	April 15	April 24	April 5	April 21	April 18
	1877	March 14	April 13	March 31	April 1	April 14	April 12
12. *Stellaria Holostea* (Greater Stitchwort)	1875	....	April 15 (?)	....	April 19 (?)	May 7	....
	1876	April 4	April 11	April 1 (?)	April 16	April 27	April 22
	1877	Feb. 14	March 20	March 27	March 26	April 23	April 8
71. *Endymion nutans* (Blue-bell) ..	1875	April 23	April 24	....	April 8	....	April 24
	1876	April 28	April 20	April 20 (?)	April 16	April 25	April 22
	1877	April 9	April 18	April 17	April 10	April 23	May 3
52. *Veronica Chamædrys* (Germander Speedwell)	1875	March 30	April 17	April 25 (?)	April 19 (?)	May 9	....
	1876	April 3	....	April 16	May 3	May 2	....
	1877	March 17	March 19	April 21	April 24 (?)	May 1	....
62. *Plantago lanceolata* (Ribwort Plantain)	1875	April 19	....	..	April 26	May 3	....
	1876	April 8	....	April 24 (?)	April 26	April 21	....
	1877	April 9	....	April 30	April 24	April 21	....
3. *Ranunculus acris* (Upright Crowfoot)	1875	April 29	....	....	March 31	May 11	May 24
	1876	April 29	....	April 24	April 14	April 25	....
	1877	April 30	....	April 26	April 24	Feb. 16	May 17

TABLE II.—*Continued.*

nd Name.	Year.	Yeovil. III.	Strathfield Turgiss. V.	Isleworth. VI.	Marlborough. VII.	Cardington XII.	Great Cotes. XV.
ga reptans	1875	April 25	May 3	May 17 (?)	May 10	May 8	....
)	1876	April 25	....	May 5 (?)	April 16	May 4	....
	1877	April 13	....	May 13	May 8	May 12	May 24 (?)
TIUM ROBER-	1875	April 23	May 4	....	April 26 (?)	May 20	May 13
M (Herb	1876	April 29	April 23	May 10	May 4	May 3	May 22 (?)
)	1877	May 11	Feb. 11	May 21	May 19	May 24	May 31
um Aparine	1875	....	....	June 25	May 3	May 13	....
ers)	1876	May 6	....	May 25	May 18	May 16	June 3
	1877	May 12	n	May 25	May 15	May 24	June 5
OLIUM RE-	1875	....	May 2	....	May 15	June 9	....
Dutch Clo-	1876	....	May 14	May 31	May 28	May 31	June 5
....	1877	May 18	....	June 10	June 2	June 8	....
ntilla anser-	1875	..	....	....	May 13	June 7	....
ilver-weed)	1876	May 11	May 22	May 23 (?)	May 18	May 24	May 31
	1877	May 21	....	June 12	May 26	May 25	June 2
s cornicula-	1875	....	May 17	June 22 (?)	May 16	June 6	....
ird's-foot)..	1876	May 13	May 29	June 10 (?)	May 27	May 30	....
	1877	May 25	....	June 5	June 5	June 7	June 12
anthemum	1875	....	May 14	May 17 (?)	May 16	May 20	....
themum (Ox-	1876	....	May 12	May 20 (?)	May 27	May 15	....
.....	1877	....	May 12	June 1	June 7	May 14	....
acium Pilo-	1875	....	....	....	May 16	May 28	....
(Mouse-ear	1876	....	....	May 23	May 25	May 18	....
weed)	1877	....	....	May 30 (?)	May 15	May 28	....
nis Flos-cu-	1875	....	May 4 (?)	....	May 20 (?)	May 23	May 9
(Bagged	1876	....	June 1	June 2 (?)	June 6	May 31	May 28 (?)
)	1877	May 30	May 25	June 2	June 10	June 8	June 5
yrus praten-	1875	....	....	June 27 (?)	May 27	June 1 (?)	June 10
adow Vetch-	1876	....	June 6	June 10	June 10	June 13	....
.....	1877	....	....	June 15	June 16	June 14	June 21
ver Rhœas	1875	....	May 18 (?)	June 8 (?)	May 21	May 24	....
Poppy) ...	1876	....	June 11	June 11 (?)	June 13	June 7	....
	1877	....	....	June 6 (?)	June 15	June 13	....
Pseud-acorus	1875	....	June 3	June 8	May 30	....	June 11 (?)
w Iris)	1876	....	June 19 (?)	June 12 (?)	June 4 (?)	June 15	June 17
	1877	....	....	June 14	June 14	June 21	June 15
canina (Dog	1875	....	....	June 9 (?)	May 30	June 9	June 6
.....	1876	....	June 12	June 13	June 13	June 9	June 15
	1877	....	June 9	June 15	June 13	June 14	June 21
VA SYLVES-	1875	....	June 13	June 8 (?)	June 5	June 5	June 3
(Common	1876	....	June 12	June 11	June 19	June 18	June 17
r)	1877	....	June 21	June 12	June 14	June 16	June 21
tys sylvatica	1875	....	June 18	....	June 9	June 13	....
e Wound-	1876	....	June 16	June 24 (?)	June 19	June 14	....
....	1877	....	....	June 17	June 22	June 18	....
lobium mon-	1875	....	June 10	....	June 17	June 24	....
(Broad Wil-	1876	....	June 11	....	June 21	June 26	....
arb)	1877	....	...	June 16	June 14	June 19	....
æa Ulmaria	1875	....	June 23	Aug. 13	June 17	June 22	June 18 (?)
ow-sweet)..	1876	....	June 18	June 30 (?	June 24	June 29	....
	1877	....	June 22	June 24	June 22	June 24	July 2
AUREA NIGRA	1875	. ..	June 18	....	June 7	June 7	....
: Knapweed)	1876	....	....	June 26	June 29	June 16	July 7
	1877	....	....	June 24 (?)	June 28	June 21	July 9
um verum	1875	....	June 26	July 14 (?)	June 24	June 25	....
r Bedstraw)	1876	....	July 16	July 3 (?)	June 27	June 27	....
	1877	....	....	July 2 (?)	June 27	June 29	July 9
hus arvensis	1875	....	June 19	June 30 (?)	July 1	June 26	June 30
Thistle) ..	1876	....	....	July 5	July 5	July 6	June 22
	1877	....	....	July 3	July 4	July 6	June 27
hus arvensis	1875	....	Aug. 1	....	July 10	June 18	....
low-Thistle)	1876	...	July 27	July 4 (?)	July 5	July 10	July 9
	1877	....	Aug. 14	July 20	July 25 (?)	July 14	July 18
VOLVULUS	1875	....	July 6	July 31	July 10	....	July 7
M (Greater	1876	....	July 2	July 5 (?)	July 11 (?)	July 16	July 29
weed)	1877	....	July 18	July 4	July 25	July 17	Aug. 6

referring to the Table it will be seen that during January and Februa plants were about a fortnight earlier this year than last, whilst the Ivy-leave Speedwell (*Veronica hederifolia*), No. 53, was in flower in December in mar places, and when found this year was frequently in seed. At Cardington was three weeks earlier than in 1876 and five weeks earlier than in 187 Besides this species mentioned, the Whitlow-grass (*Draba verna*), No. and the Barren Strawberry (*Potentilla Fragariastrum*), No. 25, were also i flower in December, and stray specimens of the Herb Robert (*Geraniu Robertianum*), No. 16, were also not uncommon in January and Februar It has been noticed that wherever a plant came into flower before Marc it was earlier than usual, but where it could not flower before the end March it was late. The Daffodil (*Narcissus Pseudo-narcissus*), No. 69, is good instance of this, being earlier where it flowered in February, but onl at its average date at Cardington, where it did not flower before the middl of March, whilst the Butter-bur (*Petasites vulgaris*), No. 36, and the Sallo (*Salix caprea*), No. 65, which had to wait till the end of the month, wer from 10 to 20 days behindhand.

The weather became milder at the beginning of April for a short time, bu turned very cold before the end of the month, and May was especially cold We can therefore see why the Milkwort (*Polygala vulgaris*), No. 10, was s much later than usual this year. The Herb Robert, No. 16, was also ver late wherever it flowered in May, for the early specimens which flowered i January and February did not last long, and the proper time of floweri was much later than usual this year. As an instance of the very slo progress of vegetation may be mentioned the fact that at Bishop Frome Hawthorn Tree, which was in bud on February 23, did not open its flowe till nearly April 24. At Great Cotes "vegetation was remarkably back ward" in May, and the Elm and Oak were showing scarcely any appearanc of leaves, and wheat was "fully a month behindhand."

The cold of May gave place to a warm June, but not till the middle of th month did vegetation seem to be up to its proper state. By that time a fe plants were a little earlier than last year, but only by a very few days.

The temperature of July was below the average, and August was a ver wet month. Harvest at Great Cotes did not begin till August 20. "Whea was very much sprouted," and it was "probably the most disastrous harve known for the last 20 years."

The year, as a whole, was very unfavourable to vegetation; the bitter col of May checked the growth of plants, and by the autumn there was comp ratively little new wood, and that not properly ripened.

The following notes of foliation, taken at Isleworth, will be interesting:—

It seems as if the date of first foliation in 1876 and 1877 had varied, bu was rather the earlier in 1877, and that subsequently (relatively to the gre heat and drought of the summer of 1876) change of tint then occurred i several cases unusually *early*, followed by *late* fall of the leaf, and in the Oa especially persistence on the boughs after withering instead of the natural fal

There was also a difference in the method of foliation of the Ash Tree. The commencement was about the same date in both years, but in 1876 the leafage developed very slowly and ungenially, whilst in 1877 (in the wet and generally unfavourable spring) the Ash leaves in this district came on heartily and well, but notably progressing more during groups of wet and cloudy days than in sunshine.

I should like to make something more out with regard to this in connection with the sayings about (I believe) the Ash *preceding* the Oak being the sign of a *hot* summer. If one kind of weather does precede another, the special leafage depending on it would be of interest, but, however, this is all doubt.

Lime, 1876. Leaves so far expanded on the upper part of the trees as to hide all but the main branches on April 29. First change of tint July 21 (this unusually early from effects of heat and drought), change of tint and fall of leaf continuing through the summer till October 14, when many were almost leafless. 1877. First sprinkling of leaves about May 10; change of tint August 22; defoliation October 21.

Horse Chestnut, 1876. Leaflets slightly expanded at beginning of April; change of colour about August 18; trees not bare till after November 11. 1877. Leaflet expansion as in previous year; change of tint exactly a month later, September 18; fall of leaf appeared complete on November 1.

Sycamore, 1876. First leafage, about 3 inches in length, May 2; the trees bare November 22. 1877. Leaves (same size as above) observable somewhat more than three weeks earlier, April 8; fall of leaf somewhat more than a fortnight earlier, November 5.

Hawthorn, 1876. Leafage beginning of May; change of tint August 18. 1877. Leafage and change of tint, in each case, about a fortnight later than previous year.

Ash, 1876. A few leaves showed on May 2, leafage proceeding slowly for several weeks; change of tint on September 12; several bare on November 22. 1877. First noticed at a later date, May 15, but then many were bursting into leaf, and leafage proceeded well (but apparently best on damp and cloudy days), so that on the 9th of June they might be considered in leaf; fall of leaf, but with little alteration of tint, on October 14; and trees bare or defoliated October 28.

Elm, 1876. Slight expansion of leaves on lower branches April 11; leafage well established May 23; change of tint about September 22; some bare November 23. 1877. Same amount of expansion mentioned above occurred now about three weeks earlier, March 23; other changes coincided almost exactly with dates of previous year, till fall of leaf, which took place at the beginning of November.

Birch, 1876. Leafage about May 21; change of tint about September 3. 1877. Leafage about May 21; change of tint about September 21.

Beech, 1876. Leaves scarcely an inch-and-a-half long May 2; partially brown and curled August 19 (this apparently under the influence of heat and

drought); defoliation established about November 17. 1877. Leafage a inch or more long April 28; change of tint August 27; many trees cle November 5.

OAK, 1876. Leaves about half-an-inch long May 2; change of tint abo September 18; some fall of leaf about the beginning of September, but th leaves, which had rather a blighted than autumnal look, adhering till pa the beginning of December, some still remaining on the 9th. 1877. Fir leafage, of similar size to above, April 26; change of tint (as in previo year) about September 18; trees generally clear about November 16.

NOTES ON THE SEVERAL SPECIES.

1. ANEMONE NEMOROSA. II. by March 21; IV. abundant March 2 VI. in flower April 2; XIII. several March 19, in bloom by March 30. Marlborough specimens were found on February 16 and 27. It is considere to be "very late" at Addington. The amplitude is small, only 29 days.

2. RANUNCULUS FICARIA. II. several January 11; VIII. a good man February 3; XIII. several February 15. A specimen was found at Mar borough as early as January 5, a second not till January 19. In the south westerly parts of England this species appears to have been unusually earl At Great Cotes it was as late as March 8, whilst at Killingholme it was early as February 13. Amplitude very great, 58 days.

3. *Ranunculus acris.* XIII. several May 19. This species appears t have come into flower a very few days later than in 1876: but from th unusual mildness of the earlier part of the year, fine specimens were i bloom in February; at Cardington they were gathered on February 1 and at Marlborough on January 5 and February 19. At Addington it wa not in flower by the end of April, but in several places it did not flowe before the middle of May.

4. CALTHA PALUSTRIS. XIII. in bloom March 22. At Marlborough specimen was found on February 8, and at Salisbury two plants were observed in flower on March 2, and it was "plentiful" on March 15; s that it was long coming into flower. The amplitude is very great, from February 9 to April 5, 55 days.

5. *Papaver Rhœas.* IV. plentiful in one field May 31, which is remarkably early. VI. in flower June 13. It is curious that so few notices of this conspicuous flower have been taken.

6. *Cardamine hirsuta.* II. in full flower before January 31; XIII. in flower April 20. It is a plant which can easily escape detection, but it is curious that it has not been seen in flower at Isleworth before the end of April.

7. *Cardamine pratensis.* XIII. several April 20: at Marlborough coloured buds were found on March 14, but no flowers till April 1. It was rather earlier this year than in 1876; but the amplitude is very large, from March 14 to April 26.

8. *Draba verna.* II. several by February 16; III. in flower in previous December; VI. in flower February 15; XIV. seed April 28. Considerably earlie than in 1876.

9. *Viola odorata.* II. several by February 16; VI. in flower March 23; XV. numerous on February 24. It is difficult to avoid thinking that cultivated specimens have sometimes been observed. At Strathfield Turgiss it is always remarkably early, whilst at Isleworth it was very late this year, though cultivated specimens were in flower on March 9.

10. *Polygala vulgaris.* XIV. in flower June 12. Had the observers at Trusham and Salisbury not been botanists, the extremely early notices from those places might have been questioned. At Ware it was as early as May 2, and at Babbacombe "by June 20." It is later than usual this year. The amplitude is very great, being as much as *eighty days.*

11. *Lychnis Flos-cuculi.* Rather later than last year; but it is curious that it was as early as May 15 at Trusham, and "full" at Maldon on May 16, whereas nowhere else did it flower before the end of May or beginning of June.

12. *Stellaria Holostea.* XIII. several March 16. It was decidedly earlier this year than last, but the difference between the dates in the south-west and east of England is very great, as much as *two months* in some places.

16. Geranium Robertianum. This species was later this year than last, but owing to the very mild weather in December and January, specimens were found in flower in January and February, but which were afterwards killed by the cold. This is probably the reason of the very early dates of Trusham and Strathfield Turgiss. At Yeovil, a specimen was gathered in flower in January, and again on April 20, and at Marlborough on February 25. At Killingholme "it may have been earlier" than May 30.

17. Trifolium repens. XIII. several May 31. The lateness of this species was generally noticed by observers. It was very early at Yeovil (May 18), and very late at Addington (June 26).

18. *Lotus corniculatus.* XIII. cultivated June 8. Later than last year. Amplitude very small, May 25 to June 12.

20. *Vicia sepium.* II. in flower April 30. XIII. several May 19. This species lasted, at Trusham, till past the end of January. It was rather later this year than last, but was late at Ware (May 27), and extremely so at Isleworth (June 22). [The specimen from Salisbury was in seed.]

22. Prunus spinosa. II. by February 21. This species is earlier this year than last, but it was long in coming into full bloom, and this may in some degree account for the great amplitude. At Salisbury "3 bushes with 2 to 3 open flowers and several buds white, some bushes quite green" on February 5. At Marlborough specimens were found in flower on February 5, 6, and March 17, 24; at Maldon on February 16, "Sloe bushes begin to look quite pink with flower-buds," and yet not till March 17 were there "a few full blown."

24. *Potentilla anserina.* II. in flower by May 22. IV. plentiful May 31; very late at Bishop Frome, and late at Isleworth. [Specimen from Isleworth very vigorous.]

25. *Potentilla Fragariastrum.* XIII. in flower February 11. At Yeovil

it was in flower in December, 1876. It was considerably earlier than usu this year, but its amplitude is extraordinary, being as late as March 22 Isleworth, and April 8 at Great Cotes, a period of over 100 days.

26. *Rosa canina.* XIII. several June 17. After making all due allowance it is curious to notice how very constant the date of flowering of this speci is, not only in successive years, but also thoughout England (as far as ou observations extend).

28. *Epilobium montanum.* XIII. in flower June 30. Very late a Salisbury.

30. *Anthriscus sylvestris.* II. several by April 12. XIII. several April 2 At Isleworth a specimen was found in flower on April 4; at Marlborough o February 5, 14, and April 1; at Lewisham on February 9; and at Watfor it was out a week by May 6. This is a plant which often flowers at od times, as will be seen by the above notes; and this may account for the ver early date at Yeovil. It was generally early this year, and at Marlborou lasted throughout the summer, specimens being still in flower on November 1

32. *Galium Aparine.* V. abundant May 15. The very insignifica flowers of this species may often be overlooked, and this may account f some of the late dates, especially at Babbicombe (June 14), but it is ver much later in the eastern counties than in the western ones. It is late a Salisbury, considering the locality. [The specimen sent was in seed.]

36. *Petasites vulgaris.* IV. upper flowers withered March 27. This is very difficult plant to observe; at Marlborough it was in flower in Decemb 1876, but the damp seems to affect it considerably, though growing i essentially watery places.

37. TUSSILAGO FARFARA. II. by February 21; IV. several March 2 VIII. several February 13; XIII. several March 7. This species is as muc as a month earlier this year than last at some places. The date fo Strathfield Turgiss (May 5) must probably refer to an unusually late speci men. It lasted till May 2 at Marlborough.

39. *Chrysanthemum Leucanthemum.* Remarkably early at Trusham (Ma 2), and unusually late at Marlborough (June 7). At Salisbury, it was no general till June 15. In 1873 it flowered at Salisbury on May 18, and i 1874 on May 7.

41. *Senecio Jacobæa.* VI. in flower July 1. At Marlborough specimen were found on June 19, but they came very slowly into flower, and it coul hardly be said to be in flower till July.

42. CENTAUREA NIGRA. VI. in flower July 1.

43. *Carduus lanceolatus.* II. by July 14. Rather later this year than i 1876, but earlier than in 1875.

44. *Carduus arvensis.* Both in 1876 and 1877 it flowered earliest a Great Cotes, usually the latest station for other species.

45. *Sonchus arvensis.* VII. by July 27. It was remarkably late both a Marlborough and Strathfield Turgiss. It was universally later this year tha last.

46. *Hieracium Pilosella.* VI. In flower June 5; XIV. in flower June

At Salisbury it was "plentiful in one lane" on May 24; and at Watford "several" were observed on June 8.

47. CAMPANULA ROTUNDIFOLIA. VI. "July 24, (?) "by" apparently to-day, might be yesterday;" it is a late date, even then. The flowering of this species was very irregular.

49. CONVOLVULUS SEPIUM. Unusually late at Marlborough and Great Cotes. [The specimen for Salisbury would indicate a rather earlier date.]

51. *Pedicularis sylvatica*. II. in flower by May 22; IV. plentiful May 24.

52. *Veronica Chamædrys*. VII. by April 26; XIII. several May 4. This plant seems to have come out very early in some spots, but to have been subsequently killed by the frosts. It is very early at Yeovil; at Strathfield Turgiss a specimen was gathered on January 14, and at Marlborough on January 4. At Salisbury one flower was seen on March 28, and one plant with two blooms on April 7.

53. *Veronica hederifolia*. II. flower and fruit February 10; III. in December, 1876; VI. flower and seed March 24; VII. all the year till the end of May, it was in flower in November, 1876; VIII. plentiful February 9. Were it not that there are so few flowers to be observed in January, it would have been advisable to have omitted this species; it is possible, however, that a plant so variable in the time of flowering as this, may be of some importance in the investigations now going on.

54. *Mentha aquatica*. VI. in flower August 6, in a favourable locality, approximate date August 1. It was rather later in 1877 than in 1876.

55. *Thymus Serpyllum*. II. by July 4; XV. about July 14. Remarkably late at both these places. At Salisbury it was "very scarce on July 12," but "by the 22nd it was beginning to form masses on the high downs." In 1872, the date of flowering was June 1; in 1873, June 19; and in 1874, June 11. This species has sadly escaped observation this year.

56. *Prunella vulgaris*. VI. date calculated by observer, even then it is the latest date recorded.

57. *Nepeta Glechoma*. VII. full flower April 26; VIII. full April 10; XIII. in flower April 15.

58. *Galeopsis Tetrahit*. VI. in flower July 21. At Marlborough a specimen was found on July 4, but no second one till July 25. [Specimen from Isleworth advanced].

59. *Stachys sylvatica*. A specimen sent from Salisbury is dated June 16, though June 18 is the date given in the returns to June.

60. *Ajuga reptans*. IV. plentiful April 30; XV. about May 24. A specimen was found at Marlborough on May 1, and at Watford it "must have been out a few days on May 13, not however on the 6th." It was early at Yeovil, but later than in 1876 elsewhere. [The specimens sent from Babbacombe were very much advanced, and that from Watford much advanced].

61. PRIMULA VERIS. IV. a good bunch and several with the first florets over, March 31; pretty numerous on the open down on April 14. It was generally earlier than in 1876, Isleworth again appearing as the most backward spot; the specimen sent was a cultivated one.

62. *Plantago lanceolata.* II. abundant in one place April 8; XIV. out several days May 31. At Marlborough it was in bud on April 14, but not in flower till April 24. At Addington it was very late.

63. *Mercurialis perennis.* At Marlborough, the barren flowers were open Jan. 25, but the fertile ones not till February 7. It was very early at Salisbury and was everywhere *much* earlier this year than in 1876.

64. *Ulmus montana.* II. by February 12; III. by February 16; VIII. March 12, though February 11 is given as the date for *U. campestris* being in full flower. At Lewisham it was fully out on February 2. The date for Strathfield Turgiss seems incorrect.

65. *Salix caprea.* II. this or a kindred species February 12; IV. "Palm Willow," February 7, very backward; V. "Salix" (male), flower February 2; XIII. "Common Willow," several February 22; at Great Cotes, fertile flower March 27; and at Maldon, male Sallow Catkins begin to appear yellow February 25. The extremely vague names render these observations practically useless.

66. *Corylus Avellana.* II. full January 31; VII. by January 17; VIII. full January 22; XIV. in flower January 20. Killingholme, pollen January 19. Fertile flowers were observed at Yeovil by January 30; Salisbury (both barren and fertile), January 2; Strathfield Turgiss, February 16; Isleworth, January 28 (barren "in flower"); Bishop Frome, February 8; Churchstoke February 6: Maldon (cultivated), February 10. The male Catkins are so long in coming to maturity, that perhaps the dates of the flowering of the fertile flowers would be the better for comparison, though *both* ought to be recorded. Isleworth again appears latest on the list.

67. *Orchis maculata.* Addington, Bishop Frome and Churchstoke are all early; the dates are almost too late for those of *O. mascula.*

68. *Iris Pseud-acorus.* The specimen sent from Isleworth was rather advanced, some flowers being over

69. *Narcissus Pseudo-narcissus.* II. freely by February 18; IV. cultivated February 13. At Maldon, a few semi-wild by February 15.

70. *Galanthus nivalis.* IV. several Jan. 18; VIII. full Jan. 22; XIV. in flower January 25. At Lewisham, January 18 (possibly out January 16) and at Pwllheli, in North Wales, they were in flower more than a fortnight (on January 24). The exceedingly small amplitude, only about 12 days, is very remarkable.

71. *Endymion nutans.* XIII. several May 2. At Watford, several April 22; omitting Trusham (where it was very late), and Marlborough (where it was early), there is a regular retardation of flowering from Yeovil to Great Cotes, where it was later than last year, whereas it was earlier than last year at the other stations.

Entomological Notices.

These have been, as usual, remarkably few; the notices furnished this year are subjoined.

72. *Melolontha vulgaris*. Isleworth, June 10; Cardington, June 9; Maldon, June 2; Churchstoke, June 4; Great Cotes, June 15.

73. *Rhizotrogus solstitialis*. Trusham, July 22; Isleworth, August 11; Cardington, July 14.

74. *Apis mellifica*. Salisbury, April 1, 9; Strathfield, twice in January; Isleworth, March 19, 25; Addington, February 14; Maldon, February 8, 9, 10; March 18, 22, 28; Ware, February 20; Cardington, March 1; Great Cotes, solitary March 5, numerous March 26.

75. *Pieris Brassicæ*. Trusham, June 3; Salisbury, May 7; Isleworth, May 29; Marlborough, May 25; Addington, May 6; Maldon, May 25; Great Cotes, May 25.

76. *Pieris Rapæ*. Salisbury, May 7; Isleworth, May 7; Marlborough, April 1; Maldon, May 7; Churchstoke, April 20; Great Cotes, May 8.

77. *Epinephile Janira*. Strathfield, June 17; Isleworth, plentiful July 7 to 14; Marlborough, June 19; Addington, June 18; Watford, June 11; Maldon, June 29; Bishop Frome, June 30; Churchstoke, June 29; Great Cotes, July 3.

78. *Bibio Marci*. Isleworth, May 3; Maldon, May 8.

79. *Trichocera hiemalis*. Salisbury, January 9; Cardington, all January and February.

Gonepteryx Rhamni. Salisbury, March 19 (?); Strathfield, March 14; Marlborough, February 10; Addington, March 27; Cardington, March 26; Churchstoke, May 14; Great Cotes, April 4.

Colias Edusa. Strathfield, May 25; Marlborough, June 9; Addington, June (about); Bishop Frome, August 14; Great Cotes, July 14.

From the preceding returns it seems that Insects were later than both in 1876 and 1875, and this is the general tone of the remarks when made by observers. The present year has been especially remarkable for the widespread and abundant occurrence of the Clouded Yellow (*Colias Edusa*), with which were the Painted Lady (*C. Cardui*) and Red Admiral (*V. atalanta*) in more than the usual numbers. As every record of the *C. Edusa* is important, the notices, as furnished by observers, are quoted.

I. Babbacombe. A large number of Clouded Yellow (*C. Edusa*) appeared about the middle of the month (of June), and continued till the end; several I caught were old and worn specimens, and most probably they had all hybernated since last autumn, the winter being so very mild; great abundance also about the middle of August.

V. Strathfield Turgiss. The most remarkable feature of this month (August) has been the occurrence of *Colias Edusa* in the greatest profusion. This butterfly was first seen in this place on the 25th May, an unusually early date. About 150 have been caught and examined, of this number 36 have been killed and set. Of these only 4 were females. *C. Hyale* not seen, although diligently searched for.

VII. Marlborough. First appearance June 9; enormous numbers were seen and as many as 170 captured by one person, many of these were females.

VIII. Addington. I make note of a very unusual occurrence for thi district, that is, the appearance of the Clouded Yellow Butterfly (*Colias Edusa*) I dare say I have seen as many as 20, and they are to be seen yet (Septem ber 6). During a period of 23 years previous to this season, I have onl seen two specimens and captured both, a male and a female, but they wer years apart, the last in 1868.

XIII. Bishop Frome. Clouded Yellow rather common during Augus and half September. Before this year I had only seen one specimen in thi neighbourhood.

XV. Great Cotes. Observed an example of *Colias Hyale* in a field c red clover in this parish on 19th June; and on the 14th July a singl example of *Colias Edusa*.

Though occurring very early in England, it appears to have come out s its usual time on the Continent. The species was generally distributed apparently, over England, and even as far as Cumberland.

Ornithological Notices

80. *Strix aluco* (Heard). XII. several times in February; XI January 17.

81. *Muscicapa grisola* (Seen). VIII. May 26; XII. June 7; XIII. Ma 19; XV. May 14.

82. *Turdus musicus* (Song). II. February 22; V. January 10; XI January and February; XIII. February 1; XIV. February 5; XV. a February; XVI. by January 1.

83. *Turdus pilaris*. XV. large flocks April 14; still lingering May 9.

84. *Daulias luscinia*. V. April 9; VI. April 29; VII. April 24; VIII April 17; IX. April 15, 20; X. April 13; XI. April 15; XII. April 20 XIII. May 9.

85. *Saxicola Œnanthe* (Seen). XII. June 25; XV. April 2, many Apr 11, in winter dress April 24.

86. *Phylloscopus trochilus* (Seen). XV. April 2; XVI. May 2.

87. *Phylloscopus collybita* (Seen). XIII. March 26; XVI. April 11.

88. *Alauda arvensis* (Song). V. February 1; VI. February 4; XI February 7; XII. February 7, 23; XIV. March 4.

89. *Fringilla cœlebs* (Song). XII. February 7, &c.; XIII. February 1 &c.; XIV. February 4.

90. *Corvus frugilegus* (Building). IV. March 8; V. February 5; VI March 10; VII. March 1; VIII. February 7; XIII. March 5; XIV. Marc 5; XVI. March 4; (Eggs) VII. March 18.

91. *Cuculus canorus* (Heard). II. April 21; IV. April 23; V. April 21 VI. April 28; VII. April 24; VIII. April 21; IX. April 19; X. May 2 XI. April 23; XII. April 23; XIII. April 16; XIV. April 24; XV. Apr 25; XVI. April 27; (note changed) VI. June 9; VII. June 26; IX June 14.

92. *Hirundo rustica* (Seen). II. April 30; V. April 17; VI. May (numerous); VII. April 7; VIII. April 23; X. April 14 (numerous); XI

TABLE III.

No. on List.	Babbacombe. I.	Watford. IX.	Malden. X.	Ware. XI.	Killingholme. XVI.
1	....	....	....	March 24	....
2	....	....	....	Feb. 7	Feb. 13
4	....	....	....	March 30	March 19 (?)
5	June 16	June 9	(June 6)	....	....
7	....	....	In bloom May 27	April 13	....
8	....	....	Full March 28	....	....
9	....	....	....	....	Feb. 7
10	By June 20	....	....	May 2	....
11	June 14	June 11	Full May 16	....	....
12	....	April 8	....	March 29	....
13	By June 15	June 17	In bloom June 26	....	....
15	July 10	....	....	....	....
16	....	May 20	....	April 19	May 30 (?)
17	..	Several June 2	....	Not in May	....
18	By June 5	June 11	In bloom June 20	....	....
19	June 25	....	....	....	....
20	....	....	....	May 27	....
21	....	June 13	....	Not in May	....
22	....	....	Few March 17	Feb. 24	March 31
23	By June 15	....	....	....	....
26	By June 15	June 13	June 8	....	June 16
28	....	June 17	....	....	....
30	....	By May 6	....	April 15	....
31	Sept. 28	....	....	....	....
32	June 14	May 27	....	May 27	....
33	July 3	....	Coloured bud June 20	....	....
37	....	....	Many Feb. 24	Feb. 7	....
38	July 10	Plentiful July 8	....	....	....
39	By June 10	May 31	A few June 7	Not in May.	....
41	July 21	....	....	....	....
44	June 14	....	....	....	....
47	(June 13)	....	....	....	....
46	....	Several June 3	....	....	....
51	....	May 5	....	....	....
52	....	April 22	....	....	....
59	....	Plentiful July 8	....	....	....
60	....	By May 13	....	May 3	....
61	....	....	....	March 14	March 29
62	....	....	....	April 24	....
63	....	....	....	Feb. 7	....
64	....	....	....	....	March 28
65	....	....	Feb. 25	....	....
66	....	....	....	....	Pollen Jan. 19
67	By June 28	June 13	....	....	....
68	By June 18	June 12	June 9	Not in May	....
69	....	....	A few Feb. 15	March 13	....
71	....	Several April 22	....	..	....

April 26; XIII. April 21; XIV. April 16; XV. April 12 (only 5 in April); XVI. April 15 (one reported April 8).

93. *Cypselus apus* (Seen). V. May 4; VI. May 31 (plentiful); VII. May 8; VIII. May 18 (plentiful); X. May 15 (plentiful); XI. May 14; XII. May 31; XIII. May 8; XIV. May 18; XV. August 30; XVI. May 15.

94. *Columba Turtur* (Seen). VII. May 8 (and heard); VIII. May 9 XII. May 10; XIII. May 7; XV. May 26.

95. *Perdix cinerea* (Egg). V. May 2; VII. May 7; XII. April 27 XIV. April 24; XV. paired February 5; (young) VIII. June 18; XII. June 12; XIV. June 5.

96. *Scolopax rusticola*. No notices.

97. Frog's Spawn. IV. March 5 (nearly hatched); V. March 2; VI. by February 14; VII. February 15; VIII. February 18; X. March 4; XI. March 30; XII. March 19; XIV. February 24; XV. March 17; XVI. March 4.

The same results as to the weather may be deduced from these ornithological notices, as were done from the botanical. The early part of the year being mild, the singing of the Thrush, Blackbird, &c., was unusually early, in fact it had commenced in December. In March nesting operations were rather retarded. In April notices were rather earlier than in 1876, and in May rather later; but, though these notices may become of value when extended over a long period, they are at present too fragmentary to serve as any foundation for general results.

The notices for the last two months must be carried over to next year, as it is important that the report should be in the hands of observers much earlier than it was this year.

In Table III. the species are arranged in the order of flowering as deduced from the average of 10 years at Marlborough.

DISCUSSION.

MR. BUDD had noticed that the Beech masts were very plentiful in Devonshire this year. He would like to know if the backwardness in the flowering of plants was due to absence of sun or low temperature.

Mr. SYMONS believed that the main mischief to plants was due to two or three nights of great cold in May.

Rev. T. A. PRESTON observed that the blossom, not only of the Beech, but of most plants, was abundant for a time, and that much fruit had set, but had been destroyed by the frosts of May. Nuts were very plentiful.

Mr. BUDD had also observed that nuts were very plentiful this year. There was an old saying in the West of England,

"Nits and Pits,"

meaning that when nuts were plentiful, pits (graves) would be also.

"*Description of F. Bogen's Standard Siphon Barometer.*" Exhibited by WILLIAM MARRIOTT, at the Meeting on June 20th, 1877.

THE chief features of this barometer are such, that it can easily be put together and taken to pieces again in a few minutes, that it occupies little space, and affords great security and convenience in travelling. The long leg of the siphon consists of a tube of the same diameter throughout, closed at one end and supplied with a wooden cleaning rod, and a glass stopper which has a fine hole passing through its centre. This tube can be filled with mercury in less than a minute; the stopper is then inserted, the hole through which being closed by the finger, the tube is inverted, and a portion of mercury allowed to flow away to produce a vacuum; the tube is then brought to a horizontal position and moved

gently, but in quick succession, to and fro, to allow all air (if there should be any) to rise freely to the upper side of the tube, and by gently inclining the tube the bubbles of rarefied air will be made to unite and travel upwards along the tube and allowed to escape at the top; the tube is then refilled to the brim. By this means a perfect vacuum can be obtained, such as could hitherto only be produced by an air pump, especially if the operation of extracting the air be repeated. The short leg of the siphon is of the same diameter as the long one, and is formed with a semicircular bend at one end; at the end of this bend is a socket to receive the open end of the long leg. The open end of the long leg is ground to fit airtight into the socket, so that the long and short legs can be instantaneously put together or separated.

The long leg having been filled with mercury, as just described, and the short leg having also been partly filled, the socket of the latter is placed over the open end of the former. The siphon so formed is then brought gently to a horizontal position to unite the columns of mercury in the two tubes; and with careful manipulation, all air can be excluded or extracted from the long leg. The barometer is mounted in a stand composed of a small slab with three legs radiating from it, each carrying an adjusting screw; from the outer ends of the radiating legs rise three arms, which unite together at their upper end to clasp and support the long upright leg of the siphon. The short curved leg of the siphon has cemented to it at the bottom a small pivot concentric with the long tube, to enter a corresponding socket in the slab. This stand affords not only the best and safest means of placing the barometer into a vertical position, but also completely prevents it from being shaken by the wind.

Upon the top of the short leg of the siphon is secured a cap through which passes a finely threaded screw of a given length, carrying at its lower end an adjustable point, and having at its upper end a graduated disc with an index point to come opposite a scale on the long leg. By turning the screw and bringing this point down to the surface of the mercury, and then turning the barometer in its support, it will readily be seen if the level of the mercury remains the same, and if not, it will be seen in which direction the barometer inclines, so that the deviation can be quickly corrected by the three adjusting screws of the stand. By means of this standard screw also a more precise and accurate reading can be obtained than was hitherto practicable.

By a peculiar contrivance, such as a white or light green paper disc, with a small hole in its centre placed over a common lens, a perfection in the reading at both ends of the mecurial column can be obtained, which is also new and avoids the error of parallax. This is called the Reflecting lens.

For reading off at the upper end of the mecurial column, a tube is used embracing and sliding on the leg; this tube has two slots on opposite sides, to allow the mecurial column to be seen. On both sides of each slot are graduated scales, with the peculiarity that a scale is graduated on both its sides; by this means a very accurate reading is obtained by reflection, and the error of parallax completely avoided. This is called the Reflecting Sliding Cylinder.

Two thermometers (an inner and outer one) are suspended from a ring which supports the three arms against the long leg of the barometer, and afford a simple and correct method of ascertaining the true temperature of the mercury as well as of the surrounding air.

For indoor work, instead of the tripod, a short board may be used, which is suspended from the wall and serves as a stand for the barometer. This affords not only the advantage of a quick and accurate adjustment, but, owing to a pivot placed at the centre of gravity of the instrument, and screwed through the board into the wall, supplies a ready means of turning the barometer to any angle, so as to fill the vacuum after every observation and inspect it when required. This practice Mr. Bogen considers necessary to ensure a correct measurement of the height of the mercurial column of barometers, and as the only means of avoiding the prejudicial depression caused by the vapour of mercury.

Method of observing with the Standard Siphon Barometer, and the advantage in reading by the disc of the Standard Screw alone:—

A great advantage is derived by using exclusively the turning disc, divided into ten equal parts, over the common method, as it affords more precision, gives no trouble, and requires less time.

Some time after having filled the barometer, take for once the height o mercurial column as commonly practised, or better still, read off the lower r the mercurial column in the long leg, adding to it the height of the meniscus, deduct the height of the lower column in the short leg. The short leg read best obtained by bringing the screw to touch the surface of the mercury i short leg, and by turning the point of the moveable hand on the disc again short scale marked on the long leg in front of it. Reduce the height obtained to the temperature of zero of the centigrade scale.

The reduced height thus obtained serves as a starting point for all fu readings made by the disc alone, adding to or subtracting from it the d value of each turn or division of the disc.

Supposing each turn of the disc corresponds to a height on the scale o tube of 0·365 millimetre, a single division would represent a height of 0·036 on the scale. As the column, however, in the lower leg ascends when that i long leg descends, and *vice versâ*, it is necessary to add or subtract doubl amount of the differential heights read off in the short leg to every heigh has been registered before. This reduction can be mentally obtained if th affixed to some prominent part of the stand a scale of nine lines, in whic double height that corresponds to each turn of the disc serves as a base, thu

		Divisions on Disc.		Double Heights in mm.
1	Turn =	10	=	0·73
2	„ =	20	=	1·46
3	„ =	30	=	2·19
4	„ =	40	=	2·92
5	„ =	50	=	3·65
6	„ =	60	=	4·38
7	„ =	70	=	5·11
8	„ =	80	=	5·84
9	„ =	90	=	6·57

Example. On the 4th January, the reduced height was found to be 760 subsequent observations were made, and the following turns of the disc noted down :—

January 4	+ 20	divisions	= + 1·46	+ 760	=	761·46 mm.
„ „	+ 45	„	= + 3·28		=	64·74.
„ 5	— 9	„	= — 0·66		=	64·08.
„ „	— 38	„	= — 2·85		=	61·23.
„ 6	— 17	„	= — 1·24		=	59·99.
„ „	— 15	„	= — 1·09		=	58·90.
„ „	— 12½	„	= — 0·91		=	57·99.
„ „	— 33	„	= — 2·41		=	55·58.

As the change of temperature is not required to be taken into consider the expansion of the mercury in the short leg, being insignificantly smal results are obtained without loss of time.

Another equally correct and quick result is obtained by reading off the l column against the scale by the pointer of the moveable hand, and addir subtracting its double heights from the reduced heights as described above it involves the trouble of reading and estimating millimetres and sub-divi by using the reflecting lens and stooping over or approaching near to the meter, which is completely avoided by the disc reading method, the divi marked on it being twenty times as long as the respective millimetre on the

* The height of the meniscus is always the same in both legs if care be taken to turn the tube q once or twice around its longitudinal axis on its concentric pivot, or by tapping on the slab of the near the pivot, when the upper and lower meniscus by the sudden vibration of the two columns will a at once their natural form, particularly so if the chloride of calcium tube is adopted to the bent order to keep the glass and mercury perfectly dry.

On a remarkable Barometrical Oscillation on January 30th, 1876. By ROBERT H. SCOTT, F.R.S.

[Read November 30th, 1877.]

IT may perhaps be of some interest to the Society to have a brief notice of what must apparently have been a sort of tornado on January 30th, 1876. At least the behaviour of the barometer at some of the stations would indicate that a very sudden depression passed over them, but yet the wind hardly shows any sign of disturbance, and I have not been able to discover a single observer who noticed any thing special in the behaviour of the clouds or the appearance of the sky on that particular morning.

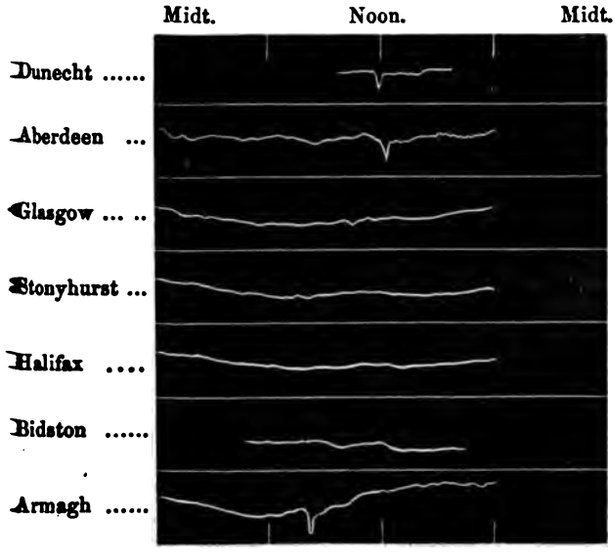
The circumstance was first brought to our notice by a remarkable dip which appeared at Armagh at 8 a.m. on the day in question. The total amount of reduction of pressure was 0·097 in. in 25 minutes, and for a portion of the time, from 8.5 to 8.10, the fall was 0·058 in., being at the rate of 0·697 in. per hour.

On looking to the other barograms it was found that while a very similar oscillation of slightly greater amplitude, 0·102 in., appeared at Aberdeen at noon, almost exactly four hours subsequent to the occurrence at Armagh, hardly a trace of disturbance could be detected in the barogram for Glasgow, and yet the last-named observatory lies almost on the direct line between Armagh and Aberdeen.

In order to see whether any other station experienced this oscillation, I have examined the barograms from Stonyhurst and Moorside, Halifax, the latter of which we owe to the kindness of Mr. L. J. Crossley, F.M.S., but they show as little disturbance as Glasgow. Fortunately there are two King's barographs in the neighbourhood of the apparent path of the phenomenon, and I have obtained tracings of the records of each. That for Bidston has been furnished by Mr. Hartnup, F.R.A.S., and that for Dunecht, Lord Lindsay's Observatory, near Aberdeen, by Dr. Ralph Copeland, F.R.A.S.

The records of all these stations, reduced to the same scale, are shown in the accompanying diagram. The Observatory of Dunecht is situated about 13 miles to the west of Aberdeen, and it is interesting to see that the oscillation took place somewhat earlier, and exhibited less intensity than at Aberdeen. At Bidston, however, which lies far more out of the probable path of the depression than Stonyhurst, the oscillation is seemingly recorded with considerable

REDUCED COPIES OF BAROGRAMS FOR JANUARY 30TH, 1876.



TABULATIONS OF BAROGRAMS, THERMOGRAMS, &c., JANUARY 30, 1876.

Armagh.							Glasgow.							Aberdeen.						
		Temperature.		Wind.					Temperature.		Wind.					Temperature.		Wind.		
Time.	Bar.	Dry.	Wet.	Direction.	Velocity.	Rain.	Time.	Bar.	Dry.	Wet.	Direction.	Velocity.	Rain.	Time.	Bar.	Dry.	Wet.	Direction.	Velocity.	Rain.
	In.	°	°			In.		In.	°	°			In.		In.	°	°			In.
6. 0 a.m.	29·727	46·6	46·0	14	19	0·000	8. 0 a.m.	29·821	44·4	42·2	15	13	0·020	10. 0 a.m.	29·983	43·0	41·5	16	12	0·010
7. 0 ,,	·738	46·8	46·2	15	13	0·050	9. 0 ,,	·825	43·9	42·0	14	12	0·060	11 0 ,,	·998	43·2	42·2	16	12	0·010
15 ,,	·741	46·7	46·0	..	..	..	15 ,,	·831	43·7	42·0	..	..	..	·15 ,,	·993	43·2	42·2	..	..	..
30 ,,	·745	46·8	46·0	..	..	..	30 ,,	·833	43·6	42·0	..	..	..	30 ,,	·984	43·1	42·1	..	..	..
45 ,,	·746	46·7	46·1	..	..	..	45 ,,	·833	43·6	42·2	..	..	..	45 ,,	·976	42·8	41·8	..	..	..
55 ,,	·744	46·7	46·1	17	..	..	55 ,,	·836	43·8	42·2	15	..	..	55 ,,	·972	42·6	41·7	14	..	..
8. 0 ,,	·717	46·7	46·2	16	14	0·040	10.0 ,,	·835	43·9	42·1	15	6	0·070	Noon.	·967	42·4	41·6	14	19	0·020
5 ,,	·707	46·7	46·2	13	..	..	5 ,,	·835	43·9	42·2	15	..	..	0. 5 p.m.	·953	42·4	41·6	14	..	..
10 ,,	·649	46·9	46·2	10	..	..	10 ,,	·835	43·8	42·2	15	..	..	10 ,,	·931	42·3	41·5	14	.	..
15 ,,	·654	47·0	46·2	11	..	..	15 ,,	·830	43·8	42·3	15	..	..	15 ,,	·896	42·1	41·3	13	..	..
20 ,,	·692	47·0	46·2	14	..	..	20 ,,	·830	43·9	42·2	15	...	..	20 ,,	·915	42·0	41·1	13	..	..
25 ,,	·713	46·8	46·1	15	..	..	25 ,,	·821	43·9	42·3	15	..	..	25 ,,	·943	42·5	41·4	14	..	..
30 ,,	·719	46·7	46·0	15	..	..	30 ,,	·816	44·0	42·3	13	..	..	30 ,,	·970	42·7	41·6	14	..	..
35 ,,	·723	46·7	46·0	15	..	..	35 ,,	·823	44·3	42·5	13	..	..	35 ,,	·968	42·8	41·7	15	..	..
40 ,,	·729	46·6	45·9	15	..	..	40 ,,	·823	44·5	42·6	13	..	..	40 ,,	·960	42·7	41·8	15	..	..
45 ,,	·729	46·6	46·0	15	..	..	45 ,,	·827	44·6	42·7	13	..	..	45 ,,	·974	42·7	41·7	15	..	..
50 ,,	·733	46·5	46·0	15	..	..	50 ,,	·834	44·5	42·7	13	..	..	5› ,,	·969	42·8	41·8	16	..	..
55 ,,	·733	46·6	46·0	15	..	..	55 ,,	·839	44·5	42·7	14	..	..	55 ,,	·965	42·9	41·9	15	..	..
9. 0 ,,	·741	46·7	46·1	15	11	0·050	11. 0 ,,	·838	44·5	42·9	14	6	0·020	1. 0 ,,	·963	42·7	41·7	15	13	0·030
15 ,,	·746	46·9	46·3	..	..	..	15 ,,	·842	45·1	43·1	..	..	..	15 ,,	·968	43·0	41·8	..	..	..
30 ,,	·751	47·0	46·4	..	..	..	30 ,,	·842	45·2	43·1	..	..	..	30 ,,	·970	43·1	42·0	..	..	..
45 ,,	·755	47·0	46·5	..	..	..	45 ,,	·838	45·3	43·0	..	..	..	45 ,,	·978	43·2	42·0	..	..	..
10. 0 ,,	·763	47·0	46·9	17	12	0·000	Noon.	·841	45·2	43·1	16	13	0·000	2. 0 ,,	·982	43·2	41·9	16	10	0·000
11. 0 ,,	·797	48·0	47·6	18	12	,,	1. 0 p.m.	·837	45·8	43·7	16	11	,,	3. 0 ,,	·992	43·3	42·1	15	8	,,
Noon	29·806	48·4	47·9	19	12	,,	2. 0 ,,	29·838	46·2	44·3	17	5	,,	4. 0 ,,	29·988	42·9	41·6	13	9	,,

The Velocity of the Wind at Armagh was *probably* very great during a few minutes; but owing to the space of time being so short, the indications on the Anemogram are not sufficiently marked to warrant tabulation. A similar remark applies to Aberdeen.

distinctness. Temperature showed no appreciable change at either Armagh, Glasgow or Aberdeen.

As regards wind, at the time of occurrence of the minimum both at Armagh and Aberdeen a temporary change of direction and increase of velocity is recorded. At Armagh the change was from S by W to ESE, and back to S by E, the whole oscillation of the vane only occupying half-an-hour, from 8 to 8.30 a.m. At Aberdeen the change was more gradual, and, in fact, hardly distinguishable from other temporary backings of the wind which occurred on the same day. At each Observatory, however, there was a great increase of velocity coincident with the epoch of most rapid fall of the barometer.

Application was made to any observers in connection with the Meteorological Office who were situated in the district affected by the phenomenon; but as the time of its occurrence was the forenoon of a Sunday, there was even less information than usual to be obtained from their registers. Inquiry was made at Stonyhurst as to the existence of any magnetical disturbance coincidently with the barometrical oscillation; but the Rev. S. J. Perry has informed me that nothing of the kind is traceable at Stonyhurst.

On looking to the Daily Weather Chart for January 30, we find that all the stations lying round the Irish Sea were affected by a considerable fall of the barometer since 8 a.m. on the preceding morning, the change being—

	In.		In.
Ardrossan	—0·17	Holyhead	—0·16
Donaghadee	—0·14	Liverpool	—0·10
Kingstown	—0·15		

Rain was reported to the extent of 0·29 in. at Donaghadee, and 0·37 in. at Greencastle. The wind was rather fresher at the stations on the St. George's Channel than elsewhere, and at Dublin it was two points to the eastward of its general southerly direction, thus pointing to some slight disturbance over the North of Ireland.

It is much to be regretted that no further records of this remarkable occurrence are procurable. It will be apparent to every one that if the minimum reading on this occasion had coincided with the time of observation at any station, that observation, at least in the North of Ireland, would undoubtedly have been suspected to have been read a tenth of an inch too low.

A somewhat similar oscillation will be found in the Quarterly Weather Report for 1869, Plate VII., where a sudden dip will be seen in the barogram for Aberdeen on January 16th, but without any perceptible effect on the wind. At Glasgow a dip, but of less extent, is noticeable at 1 p.m. on the same day, but here the wind backed from SE to N almost instantaneously, and then veered again as far as South.

DISCUSSION.

Mr. STRACHAN said that, as Mr. Scott had pointed out, that if the minimum reading on this occasion had coincided with the time of observation at any station, that observation might have been held to have been read a tenth of an inch too low, he wished to remark that on such occasions the decided change in the direction or force of the wind or the weather would sufficiently direct the attention of the observer to the fact that something unusual was taking place, so that he would not be likely to misread the instrument; and the same correlation of phenomena would always afford the means for a computer to check doubtful observations.

The "Arched Squalls" of the neighbourhood of the Trade winds and of those regions where the Monsoons blow with slight force, and with interruptions. By Captain A. SCHUCK, of Hamburg.

Translated by Mrs. TOYNBEE from a Paper printed in the 'Annalen der Hydrographie,' March, 1877.

[Read November 21st, 1877.]

IN all those parts of the world where the strength of the Trades and Monsoons is diminishing, on the borders of those Wind-systems, and in the region of the light Westerly winds which are the off-shoots of the Trades, the moisture brought

by them is collected in great masses, which even an upward stream of air can remove. This vapour is not equally distributed over those regions; but o over the sea itself, and often at a small height above its surface, ring-sha beds of cloud are formed, which sometimes have a movement of their own, sometimes driven by the prevailing light breeze, and are also sometimes stat ary. On the front side (that is the side towards the wind) of these appearan severe thunder-storms are often experienced, at other times there is not a t of thunderstorm; sometimes there is much rain, but at others there is none, the force of the wind varies between 9 and 3 of the Beaufort scale.

English seamen have given the name of "arched squalls" to these phenome their course is not the same in all parts of the world, but there is a great si larity between those of different parts of the sea. In the Atlantic Ocean t usually appear in the following way :—

At some place to windward of the observer, the mist over the water beco thicker, compact cloud masses are formed, not only immediately over that pl but in its neighbourhood the moisture forms into light clouds which are tracted towards it; the whole appearance, however, is not like a water-sp (*i.e.* a funnel), but like a mushroom with a very high cup, without a stalk, with a base of extremely loose consistency. The colour of the clouds above, both day and by night, is a clear, almost bright, white, while below it becomes d black, and between these a dirty dark grey. By day the sun breaks out shar from amidst the flying vapour, by night the stars twinkle strangely, a light breatl air flutters uncertainly towards the cloud mass, underneath it becomes ever dar and darker, the air grows cold, sounds are sharp and clear, a black line is s over the water under the inner border of the cloud-covering, faint violet lightn moves between it and the surface of the sea, and from this time there appea huge ring, which enlarges and enlarges, and over which tremendous masses clouds rise higher and higher till they have gathered over the observer. A slight distance from this ring it becomes as still as death, then a thunderst breaks forth, with bright zig-zag lightning, and sharp sparks like phospho which seem to spurt out through the whole atmosphere; thunder is heard in d ening peals, and the storm may last for half an hour before the deluge of r comes to an end.

These squalls are sometimes accompanied by little wind, without any thun and lightning, or rain; then light clouds surround a dark, compact mass form a ring, with an apparently upturned edge. Such masses of cloud rise hig and higher like the former ones, and the moisture is seen between them, hav a dark-grey appearance, with yellowish shading; if rain falls it is with a holl murmur, and it gives to the water a peculiar hopping motion. If the ring co nearer, one can see clearly how light clouds fly round the heavier; one hea wonderful roaring and howling in the rigging, but the wind only reaches forc at most, and lasts longer than in the former phenomena.

These squalls are however on a much grander scale and are more violent in tropical waters of Eastern Asia, particularly in the southern part of the China S the Gulf of Siam and the Sulu Sea; to the south of Java they often resolve the selves into water-spouts, and near the coast the arrival of the land-breeze is c stantly accompanied by arched squalls of the second kind of very large diame and accompanied by thunder and lightning. One must have been often in th regions on the edge of a squall of the first kind, or between two rising at same time, or trying to steer out of their way, in order really to believe w solid, sometimes almost stationary, clouds and masses of thunderstorm formed there—one must have been many times in such arched squalls, order to be really convinced that the accounts of storms in which these wond ful displays of electricity simultaneous with the peals of thunder, are not m fairy-tales; and that really down-pours of rain take place, which tear sails, so affect the standing rigging that lanyards are broken, or the trestle-trees the lower masts sprung;—and that finally there is sometimes a calm, sometir a light, pleasant breeze, and sometimes a hurricane-like storm, without th having been a sign from what direction and how strong the wind would come.

Judging from description, such meteors are also met with in the West Ind the Gulf of Guinea, the Arabian Sea, the Bay of Bengal, and the Mons regions of the Pacific Ocean. Such descriptions are useful to the seaman

preparing him for such manifestations, but they only sketch the outward appearance, and the impression on the mind; they give no exact data, and offer very slight help towards the solution of the following questions:—

What circumstances must coincide to cause the rise and disappearance of such phenomena?

What are the peculiarities of the qualities of such a meteor from the beginning of its formation, until it is completely dissipated into the usual meteorological conditions of the neighbourhood?

So few observations have been published, that we cannot yet attempt this solution; and the three following accounts will show how little the existing material can avail for such special ends; one has only lately been communicated to me, and the other two are from my own experience. A criticism (more especially of the latter) will show how easy it is to supply gaps, but how great is the uncertainty of conclusions built on single observations; and as a criticism of one's own faults can offend no one, I hope that it may help towards making ship captains useful to science, to themselves, and to their professional brethren.

1. The German barque 'Ino' of Hamburg, on the 20th January, 1872, on the voyage from Foochow to Falmouth, was in 2° 53′ S lat. and 19° 49′ W. long. The SE trade had ceased on the morning of that day, and variable winds and squally weather had set in. About 2 p.m. a strong breeze blew from SSW, with thick weather, heavy clouds gathered ahead, and they therefore expected a stronger wind from these, or from the neighbourhood of the masses of cloud, and took precautions accordingly. As soon as they reached this cloud, which was streaming with heavy rain, the wind came suddenly from the N, with force 5; then a squall lasting about ten minutes from NE to E, force 7, which drove the ship quickly to the NW. When this squall was over, it became perfectly calm, the rain ceased, a thick, dark, very low, and apparently stationary cloud, covered the heavens, heavy masses of cloud and mist gathered all round, which swiftly swept round the ship close to the water on all sides, decreased in speed, and seemed to unite with the upper clouds, bounding the circle of vision to 1-1½ nautical miles. The 'Ino' lay motionless in the calm, apparently in the centre of a revolving storm, whose inner visible portion might have a diameter of from two to three nautical miles. The observer expected that the storm would pass over him, but as it appeared to have no forward movement, he thought he must try to get out of it. A light easterly air gave the ship steerage way, and they sailed to the West; but as they approached the storm on that side the strength of the wind increased, its direction altered to SE—S—SSW, and they sailed quickly to the NW into the midst of the rapidly-moving masses of vapour; it became very dark, for about five minutes the wind blew from SW, force 8; then it decreased, and heavy rain fell. About three o'clock the rain ceased, a calm came on, and soon after three a light easterly wind. The whole phenomenon had scarcely lasted an hour, and the dark black squall remained visible on the horizon in the SE. Judging by the time which the ship took to pass through the ring of the whirlwind, it may have been at the most one nautical mile wide; the diameter of the whole meteor may have amounted to from four to six nautical miles.

2. The German brigantine 'Alice,' of Hamburg, Captain A. Schück, from Hong Kong to Hamburg. At 8 p.m., on the 25th January, 1870, (see accompanying extract from his log), faint lightning was first noticed in the NW and SW; it increased more and more, and by twelve o'clock, with a decreasing NE wind, the ship seemed enveloped in a lukewarm moist mass of cloud, which discharged its electricity in an upward direction, with faint rolling thunder. We concluded this from seeing that the unceasing lightning was seldom directed downwards; it was ashy in colour, but when it appeared between the clouds and the sea it was violet. At two a.m. a strong squall with rain blew from the NW, and soon after the ship emerged from the clouds, which, however, were still visible and compact up to three a.m. From two p.m. on the 24th, till six a.m. on the 25th, the swell rapidly increased from the WSW and NW, and remained high until about four p.m. on the 26th, when it gradually decreased. During the half-hour of rain at two a.m. and the hour of rain at four a.m. on the 25th, the sea appeared transparent and of an ultramarine blue tint.

3. British Barque 'Cæsar,' Captain A. Schück, 1864, August 22nd, from Singapore to Macao, 13° 15′ N, 114° E. At six p.m. a bank of clouds had been

1870. January.	Hour.	Lat. S.	Long. E.	Wind. Direction.	Wind. Force.	Barometer reduced to 32° F.	Air Temp.	Vapour Tension.	Humidity.	Cloud. Character.	Cloud. Amount.	Cloud. From	Weather.	Current (in nautical miles.)
		° ′	° ′			In.	°	In.						
25	0	31 0	35 58	ENE	3—4	29·977	78·1	0·851	90	Cum	6	....	*m*	S½W 13
,,	3	..	..	NE	3	·941	78·4	·890	92	Cir-Str	8	NE	*m*	....
,,	4	..	..	NE	3	·930	77·9	·874	92	Cir-Str	8	....	*m*	....
,,	6	..	..	NE	3	·898	76·3	·878	99	Cir-Str	9	....	W	....
,,	8	31 15	35 4	NE	3	·910	75·4	·862	100	Cum-Str	8	NW	W l	....
,,	10	..	..	NE	3	·926	75·6	·862	100	Cum-Str	8	....	W l	....
,,	12	..	..	NE	3	·918	76·3	·886	100	Cum-Str	10	....	W l	....
,,	14	..	..	NE	2	·910	75·6	·901	100	Cum-Str	9	....	r l	....
,,	16	31 26	34 26	NW	8	·859	74·5	·866	98	Cir Cum-Str	7	....	r l	....
,,	18	..	..	Vble. to SSW	..	·878	74·5	·799	88	Cir Cum-Str	7	....	..	....
,,	20	..	..	SSW	2—4	·938	76·1	·835	89	Cir Cum-Str	6	....	..	....
,,	22	..	..	SSW	5	·961	77·4	·847	89	Cir Cum-Str	10	....	..	....
26	0	31 42	33 43	S	6	·985	77·4	·799	85	Cir Cum-Str	10	....	..	W by S 20
,,	3	..	..	S	6	·997	74·8	·697	81	Cum	5	SW	..	....
,,	4	..	..	S	5	29·993	75·0	·700	81	Cir Str-Cum	6	S	..	....
,,	6	..	..	S	5	30·016	74·3	·634	75	Cum	6	....	..	....
,,	8	31 48	33 6	S	4	·056	73·4	·642	77	Str	4	....	..	....
,,	10	..	..	S	4	·099	72·3	·634	77	Cum	7	SW	..	....
,,	12	..	..	S	4	·111	72·3	·622	80	Cum	6	SW	..	....
,,	14	..	..	S	4	·099	73·8	·615	80	Cum	5	SWly	..	....
,,	16	32 5	32 19	S	4	·083	70·5	·599	80	Cum-Str	5	E	..	....
,,	18	..	..	SE	2—3	·103	71·6	·575	72	Cir	3	....	*m*	....
,,	20	..	..	SE	2	·103	75·0	·634	75	....	3	Bank in NW	*m*	....
,,	22	..	..	ESE	3	·103	74·5	·634	75	Cir	3	Bank in NW	*m*	....
27	0	32 24	31 38	ESE	3	30·056	75·0	0·634	75	Cir	3	Bank in NW—SW	*m*	SW 11

noticed in the NNE, the remaining clouds being cirro-cumuli, moving from the W ; five-tenths of the sky were overcast, and a slight swell came from the SW ; by eight p.m. cirro-cumuli from N, SW, and SE, had covered nearly the whole heavens ; the wake shone whiteish, and besides the swell from the SW, another was remarked from the NW. At ten p.m. there was constant white sheet-lightning in the N. Course and distance from 6 to 8 p.m. were N ½ E, five nautical miles ; from 8 to 10, N ½ E five miles :—from 10 to 1 a.m. N ½ E, eight miles ; from 1.30 to 2 a.m. SSE, one mile. Wind from 1.5 a.m. West 3. At 1.5 a.m. the bank of clouds, which until then had been stationary in the N, formed itself into a thick mass, which took the shape of a deep dish (the opening turned towards the sea) ; it stretched from NNW to ENE, the most distant part apparently resting on the horizon, but the nearest was only about one nautical mile from the ship and a few hundred feet over the sea. This part slowly approached, the rest of the cloud drove quickly to the NW, and the wind almost ceased. From 1.5 a.m. to 2 a.m. the ship was steered to the SSE one mile, the wind then went slowly from W to NW, N and NE ; at two a.m. the ship was again steered N ½ E. When the wind was at NE, force 3, the cloud-ring broke ; the wind then went to E, force 1, and at 4 a.m. it was SE, force 2, then turned again to the S, and at sunrise was SW, force 3. With the exception of the swells from SW and NW, the water was smooth ; the lower part of the cloud-ring was of the same brownish yellow colour as a lunar rainbow. At mid-day of August 23rd, the difference of the ship's position by dead reckoning and by observation was N 53° E 17 miles.

4. The Hamburg Brigantine 'Alice,' Captain A. Schück, was in 21° S and 111° E on the 8th August, 1866. From mid-day until four p.m. the wind had been NW b N, force 5 ; and at 4 p.m. it came from the SW, force 3, with a ring of clouds (like a dish) as I had often before seen it in tropical waters ; on the edge of this ring the wind was very light and revolving. The ship's course was NE b N—in the morning the phenomenon had been visible astern, it came up slowly and gradually, and at sunset had not disappeared ahead of us.

Remarks by Captain Toynbee.

Captain Schück next proceeds to theorise on the extent of these squalls, but as he truly says, "the observations of one ship are not a sufficient foundation, and seamen must observe much more frequently and more carefully in order to gain all that may be learned from these phenomena of nature."

Captain Schück's remarks do not add to our knowledge of the cause of squalls, but they point to the fact that the observations of captains who are in different parts of the same squall would be very useful ; and it is hoped that the subject may have more attention in future.

Note on a peculiar fog observed at Kew, October 18th, 1877. By G. M. Whipple, B.Sc., F.R.A.S., Superintendent of the Kew Observatory.

[Read December 19th, 1877.]

During my connection of now twenty years duration with the Kew Observatory I have acquired considerable familiarity with the appearance of fogs of various kinds. The one I have now to bring before the notice of the Society being of an exceptional character. I particularly observed it, and the following is a general summary of my notes :—

The afternoon of October 18 was fine and clear, and the air perfectly calm for long periods together. Looking from the Observatory towards the south-east about 4.45 p.m., I was struck with a somewhat remarkable stratus cloud which appeared settling down upon the town of Richmond ; and a few minutes after, at 5 p.m., on leaving the Observatory by the north door, in company with Mr. Baker, first assistant, we simultaneously remarked, "What a singular fog is coming up from the north-east !"

It presented the appearance of a dense dark cloud, of which the lower edge sharply defined floated horizontally about 10 to 20 feet above the ground, whilst the top was very irregular.

In breadth it extended about half a mile, and all around the remainder of the horizon was perfectly clear and devoid of mist, although we were looking over the river and across the low marsh land on its banks.

The air at the time was so calm that the anemometers were standing perfectly still, and the smoke from chimneys rose perpendicularly, yet the fog advanced, and we walked across the park to meet it. Its appearance was singular as we approached. The front edge was slightly inclined towards the horizon, but the greater part was perfectly level, and we could see with the greatest clearness and distinctness beneath it objects and cattle grazing nearly a mile distant, whilst the upper portion of trees not very far off were faintly visible through the fog. We were at one time inclined to think that it must be a large mass of smoke from a fire, but I have not heard of one taking place in the neighbourhood, and we watched a wreath of smoke ascending through the midst of it from the shaft of the Royal Laundry, which did not mix in any way with it.

After about a quarter of an hour the haze became general, and the appearance similar to that of an ordinary fine autumnal evening.

Mr. Constable, an assistant at the Observatory, was at the same time travelling by train towards Kingston, and the general aspect was so peculiar there that the general attention of the passengers was drawn to it. He observed the smoke from a row of houses, after rising to some height, vertically flattened down and spread out into a continuous sheet. The manner in which the edge of the fog rose to pass over a wall was much commented upon.

I have never before seen such a fog by daylight, but twice at night have experienced the phenomenon of a dense black fog, so thick that I have been unable to distinguish the presence of a friend at my side without touching him, and with a boundary almost like a vertical wall, causing a very strange sensation upon abruptly emerging from the fog into clear space.

The meteorological observations at the time were as follows :—

Barometer reduced to sea level, 30·321in.

Dry bulb thermometer	44°·5 falling
Wet „ "	39°·7
Dew point	32°·6
Relative humidity	66

Atmospheric electricity—weak positive.

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

NOVEMBER 21st, 1877.

Ordinary Meeting.

HENRY STORKS EATON, M.A., President, in the Chair

Professor EDWARD DOUGLAS ARCHIBALD, B.A., Bankipore, Dacca, Bengal;
ROBERT WILLIAM PEREGRINE BIRCH, Assoc.Inst.C.E., 5 Westminster Chambers, S.W.;
Captain WARREN FREDERICK CABORNE, 4 Cambridge Gardens, Notting Hill, W.;
HENRY CLARKE, L.R.C.P., F.S.S., West Riding Prison, Wakefield;
J. J. COHEN DE LISSA, F.R.G.S., F.S.S., Port Louis, Mauritius;
ROBERT GORDON, M.Inst.C.E., Henzalidah, British Burma;
JOHN HUNTER, Junr., Field Head House, Belper;
JOHN JOSEPH LAKE, 2 Brampton Villas, Soho Road, Birmingham;
Rev. ETHELWALD AUGUSTINE DOUGLAS O'GARA, O.S.B., St. Augustine's Monastery, Ramsgate;
ROOKE PENNINGTON, B.A., LL.B., Castleton, Derbyshire;
EDWARD ELLISON PRICHARD, Assoc.Inst.C.E., Public Works Office, Transkei Territory, South Africa; and

Rev. S. J. W. SANDERS, M.A., F.G.S., Grammar School, Northampton, were balloted for and duly elected Fellows of the Society.

Mr. E. G. ALDRIDGE and Mr. R. STRACHAN were appointed Auditors of the Treasurer's Accounts.

The SECRETARY read the following letter from Mr. H. C. RUSSELL, B.A., of the Sydney Observatory, respecting the Thermometer referred to in his Paper read November 15th, 1876. (Vol. III. p. 302):—

"I send you by this mail the dry bulb thermometer about which I sent you the notes last year. I note Mr. Hicks's explanation, but do not think it is sufficient for the following reasons:—(1) The thermometer had before been frequently subjected to similar and even greater temperatures than that of the day before its change, without showing any sign of error. (2) If a piece of glass which had separated the supposed two tubes broke on that occasion, then the changes must have been repeated whenever the temperature rose to the same height, but this has not been the case.

"I can understand air in a confined false bore expanding and producing the error in question, and that the tube might be so fine that it would for a long time hinder the mercury from returning to its normal position; but if there is a confined mass of air which has power at a given temperature to force up the mercury I cannot see any reason why the same temperature should not always produce a similar result. It is to be borne in mind also that the changes recorded were coincident with unusual disturbances; and it is remarkable that, of the small changes which have taken place during the last six months, the most remarkable was noticed after a very violent thunderstorm on March 16th last, when the temperature was only about 68°, while on January 6th the maximum was 93°·8 and on March 1st, 90°·9, and no changes appeared in the thermometer in question."

The thermometer, which unfortunately arrived with the bulb broken, was handed over to Mr. WHIPPLE for examination, who reported as follows:—

"This instrument is the one referred to in a paper read before the Society on November 15th, 1876, entitled "Notes on some remarkable errors in Thermometers recorded at Sydney Observatory." Its peculiar behaviour in suddenly changing its readings by large amounts was attributed by Mr. Hicks to the probable presence of what is termed a secondary or foul bore, and this supposition was confirmed both by Mr. Pastorelli and myself.

"Mr. Russell, on the receipt of this opinion, examined the thermometer, and thought that the explanation was incorrect, but forwarded the thermometer to the Society for their examination. Unfortunately it arrived with the bulb broken in transit, but the tube was handed me by the Council to report upon.

"Inspection of the column with an ordinary magnifier showed at once the existence of a false bore of considerable size, but on placing the instrument under a microscope it was seen that in reality there were two bores as well as the main one, and that they both extended through a considerable length of the tube. On examining the broken bulb one larger false bore was plainly seen to open into it, but the smaller one could not be distinguished with certainty.

"In order to prove the existence of these apertures, as well as to render the false bores better visible, I heated the tube strongly in a flame and then plunged the bulb extremity in coloured alcohol. The effect of the cooling was to cause the fluid to ascend in all three bores, where it now remains, clearly indicating their presence, and proving that the cause assigned by Mr. Hicks was the one which brought about the variations observed by Mr. Russell."

The following Papers were read:—

"On the general character, and principal sources of variation, in the weather at any part of a Cyclone or Anticyclone." By the Honourable RALPH ABERCROMBY, F.M.S. (p. 1.)

"On a remarkable Barometric Oscillation on January 30th, 1876." By ROBERT H. SCOTT, M.A., F.R.S. (p. 73.)

"The 'Arched Squalls' of the neighbourhood of the Trade Winds." By Captain A. SCHUCK. (p. 75.)

The Meeting was then adjourned.

DECEMBER 19th, 1877.

Ordinary Meeting.

HENRY STORKS EATON, M.A., President, in the Chair.

Commander EDMUND GEORGE BOURKE, R.N., Sheerness;
JOHN ANDREW DOUGLAS, 23 Bentley Street, Bradford;
WILLIAM H. LA TOUCHE, B.A., Grammar School, Sutton Vallance;
GEORGE JOSEPH PEARSE, 10 Whitehall Place, S.W.;
W. S. ROGERS, Medina Road, Cowes; and
WILLIAM TYRER, Grove House School, Mansfield,
were balloted for and duly elected Fellows of the Society.

The following Papers were read:—

"Notes on the Meteorology and Physical Geography of the West Coast of Africa, from Cape Verd to the Cape of Good Hope." By Commander EDMUND GEORGE BOURKE, R.N. (p. 25.)

"On the Meteorological Observations made by the Norwegian Research Expedition in the North Atlantic in the summers of 1876 and 1877." By Professor H. MOHN, Hon. Mem. M.S. (p. 32.)

"Report on the Phenological Observations during 1877." By the Rev. T. A. PRESTON, M.A., F.M.S. (p. 54.)

"Note on a peculiar Fog observed at Kew on October 18th, 1877." By G. M. WHIPPLE, B.Sc., F.R.A.S. (p. 79.)

The Meeting was then adjourned.

Donations received from October 1st to December 31st, 1877.

Presented by Societies, Institutions, &c.

Bombay	Meteorological Office	Report on the Administration of the Meteorological Department in Western India, 1876-77.
Brisbane.....	General Registry Office..	Report on the Vital Statistics, June to August.
Brussels	Observatoire Royal.....	Bulletin Météorologique.
	Société Belge de Géographie	Bulletin, No. 5.
Calcutta	Meteorological Office	Report on the Meteorology of India in 1875.
	,, ,,	Indian Meteorological Memoirs, Vol. I. Part 1.
	,, ,,	Report on the Administration of the Meteorological Department of the Government of India, 1875-76.
	,, ,,	Report on the Vizagapatam and Backergunge Cyclones, in October, 1876. By J. Eliot.
	St. Xavier's College Observatory	Meteorological Register, January to June.
Christiania ..	Norske Meteorologiske Institut.....	Jahrbuch, 1875.
Copenhagen ..	Danske Meteorologiske Institut	Annuaire Météorologique pour l'année 1876. Première partie.
	,, ,,	Bulletin Météorologique du Nord, September 1.-November 30.
	,, ,,	Le Foehn du Groenland. Par N. Hoffmeyer.
Cracow	K. K. Sternwarte.....	Meteorologische Beobachtungen, August to November.
Fiume	I. R. Accademia di Marina	Meteorological Observations, July to October.
Geneva	Société de Géographie ..	Le Globe. Tome XVI., Livraison 3.
Hamburg	Deutsche Seewarte	Wetterbericht.
	,, ,,	Monatliche Uebersicht der Witterung, October, 1876; June and July, 1877.
Kew.....	Observatory	Report for the year ending October 31.
London	General Registry Office ..	Weekly Return of Births and Deaths, Nos. 39-51.
	,, ,,	Quarterly Return of Marriages, Births and Deaths, September 30.
	Meteorological Office	Daily Weather Reports and Charts
	,, ,,	Hourly Readings, January to March.
	,, ,,	Report of the Meteorological Committee of the Royal Society for the seventeen months ending 31st May, 1877.
	,, ,,	Meteorological Observations at Stations of the Second Order. Part I. January to August, 1876.
	,, ,,	Instructions to Meteorological Observers in India. Part I. By H. F. Blanford.
	,, ,,	Tables for the Reduction of Meteorological Observations in India. By H. F. Blanford.
	Royal Astronomical Society	Monthly Notices. Vol. XXXVII. No. 9. Vol. XXXVIII. No. 1.

London	Royal Botanic Society ..	Abstract of Meteorological Obervations made at the Royal Botanic Garden, 1871 to 1876. With remarks by G. Symons.
	Royal Society	Proceedings, No. 183.
	Science and Art Department of the Committee of Council on Education	Catalogue of the Special Loan Collection Scientific Apparatus at the South Kensington Museum. Third Edition.
	Society of Arts.....	Journal, Nos. 1298-1310.
	Society of Public Analysts	The Analyst, Nos. 19-21.
Madrid	Sociedad Geográfica	Boletin. Tomo II. No. 3. Tomo III. No. 2-4.
Marlborough ..	Marlborough College Natural History Society ..	Twenty-fifth Half Yearly Report.
Melbourne	Observatory	Monthly Record of Results of Observations in Meteorology, Terrestrial Magnetism, &c., January to May.
Mexico	Ministero de Fomento ..	Boletin. Nos. 26-58.
	,, ,,	Boletin Meteorológico. March.
	,, ,,	Observations taken at the Central Meteorological Observatory, at 6h. 7m. a.m. August 16 to October 15.
Moncalieri	Osservatorio del R. Collegio Carlo Alberto	Bullettino Meteorologico, Vol. XI. Nos. 10-12
	,, ,,	Osservazioni Meteorologiche, August to October.
Naples.....	Osservatorio della R. Marina	Osservazioni Meteorologiche, 1847-1858.
Paris	Observatoire de Montsouris	Bulletin Mensuel, Nos. 65-69.
	Observatoire National ..	Bulletin International.
	Société Météorologique de France	Annuaire Bulletin des Séances, 1873. Feuilles 6-30; 1877, 32-41. Tableaux Météorologiques, 1873, 5-11; 1875, 5-16, 1877, 1-7.
Perth	Surveyor General's Office.	Meteorological Report for Western Australia for 1876.
Rome	Ministero d' Agricoltura	Meteorologia Italiana. Bollettino Decadico, Nos. 21-30. Bollettino Mensile, March to June.
	,, ,,	Supplemento. Anno 1877. Fascicolo I. and II.
	Osservatorio del Collegio Romano	Bullettino Meteorologico, July and August.
Stockholm	Kongl. Svenska Vetenskaps Akademien	Meteorologiska Iakttagelser i Sverige, 1874.
Sydney.....	Royal Society of New South Wales.....	Rules and List of Members, 1877.
Toronto	Meteorological Office	Reports of the Meteorological, Magnetic and other Observatories of the Dominion of Canada, 1876.
Upsala	Observatoire de l'Université.....	Bulletin Météorologique Mensuel, November and December, 1876.
	,, ,,	Observations Météorologiques horaires, exécutées par une Société d'Etudiants du 30 Mai 1865 au 9 Août 1868, continuées jusqu' au 30 Novembre suivant au moyen d'Appareils enregistreurs.
Vienna.....	K. K. Centralanstalt für Meteorologie und Erdmagnetismus	Beobachtungen. August to October.
	Oesterreichische Gesellschaft für Meteorologie.	Zeitschrift. Nos. 17-24.
Washington. ..	Smithsonian Institution	Annual Report of the Board of Regents, 1876.
	War Department.....	Monthly Weather Review, August to November.

Washington ..	War Department.....	Daily Bulletin of Weather Reports, with the Synopses, Probabilities and Facts, April and May, 1874.
Watford	Natural History Society..	Transactions, Vol. I., Part 8, December.
Zurich.....	Meteorologische Centralanstalt der schweizerischen naturforschenden Gesellschaft	Schweizerische meteorologische Beobachtungen, 1875, Part 6; 1877, Parts 1 and 2; Supplement, Part 3.

Presented by Individuals.

Bianconi, Dr. G. A.	Prove della Contemporaneità dell' Epoca Glaciale col Periodo Pliocenico a Balerna e a Monta Mario sul Reno.
Blanford, H. F., F.G.S. ..	On the Physical Explanation of the Inequality of the two Semidiurnal Oscillations of Barometric Pressure.
Brooke, C., M.A., F.R.S...	Journal of the Society of Arts, Vols. IV. to XXIV.
Buchan, A., M.A., F.R.S.E.	The Mean Pressure of the Atmosphere and the Prevailing Winds over the Globe, for the Months and for the Year. Part II.
Dunlop, W. H.	Results of Meteorological Observations made at Annanhill, Kilmarnock, Ayr, August to November.
Eaton, H. S., M.A.	On the Geology of the South-East of Devonshire. By R. Austen.
, ...	Address by Lord Wrottesley to the British Association, 1860.
, ...	On the Chesil Bank, Dorset, Raised Beach at Portland. By H. Bristow, F.R.S., and W. Whitaker.
,, ...	On Geology and Consumption. By W. Whitaker.
,, ...	On the Pebble Bed of Budleigh Salterton. By W. Vicary. With a note on the Fossils, by J. W. Salter.
,, ...	Marine Engineering. By J. B. Redman.
,, ...	Second Report of the Commissioners appointed to inquire into the best means of preventing the pollution of Rivers (River Lee), Vols. I. and II.
,, ...	Select Committee on Metropolis Water Supply Bill. Minutes of Evidence. Lee River Trust Bill.
,, ...	Mittheilungen, 1856. IX. By Dr. A. Petermann.
,, ...	Ueber die mittlere Temperatur zu Wien, nach 90 jährigen Beobachtungen, und über die Rückfälle der Kälte im Mai. Von Dr. C. Jelinek.
,, ...	Rapport sur un Mémoire de M. Guitard, intitulé, du double mouvement de Rotation et de Translation de la Terre et des autres Corps Celestes. Par M. Abria.
, ...	De la Vitesse de la Lumière dans les différents milieux. Par M. Abria.
,, ...	Etude sur la Constitution d'un Rayon dans la Théorie des Ondes. Par M. Abria.
Fritsch, Dr. K.	Die Eisverhältnisse der Donau im Lande Oesterreich ob und unter der Enns in den Jahren 1864-1868; 1868-1873.
,, ...	Jährliche Periode der Insectenfauna von Oesterreich-Ungarn II. Die Käfer (Coleoptera).
Hankinson, R. C.	The Weather at Red Lodge, Southampton, September to November (MS.).
Hébert, M. F. F.	Histoire de l'Atmosphère en Septembre, 1876.
Hellmann, Dr. G.	Die täglichen Veränderungen der Temperatur der Atmosphäre in Norddeutschland.
,, ...	Ueber die Sommerregenzeit Deutschlands.
,, ...	Feuchtigkeit und Bewölkung auf der Iberischen Halbinsel.
Hoskins, S. E., M.D., F.R.S.	Meteorological Observations, Guernsey, September to November.
Melsens, Prof. L. H. F. ..	Description détaillée des Paratonnerres établis sur l'Hotel de Ville de Bruxelles en 1865. Exposé des Motifs des Dispositions adoptées.
Miller, S. H., F.R.A.S	The Fenland Meteorological Circular, October to December.

Poëy, Prof. A.	Rapports entres les variations barométriques aison du Soleil.
Quaritch, B.	A General Catalogue of Books. The Suppl 77.
Quetelet, E.	Rapport de M. E. Quetelet sur 'Quelques propos de l'hiver de 1876-77. Périodicit doux et des étés chauds.' Par M. A. Lanc
Silver, S. W.	The Colonies and India. Nos. 267-280.
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QUARTERLY JOURNAL

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VOL. IV. No. 26.

An *Address delivered by the President*, HENRY STORKS EATON, M.A., *at the Annual General Meeting, January 16th*, 1878. (Plate II.)

GENTLEMEN,—Before leaving the chair I wish to make some brief remarks upon the proceedings of our Society during the last two years in connection with the Meteorological Office, and upon the results to be anticipated from our joint work. In the above period, as you may be aware, that office has been reorganised and enlarged under the title of the Meteorological Council, and the alliance between it and our Society, so happily inaugurated in 1875, has been further cemented. The present basis of co-operation between us is that we supply the Meteorological Council with copies of the monthly observations, and with certain reductions from a limited number of our stations, at a charge which covers the cost to ourselves. This arrangement seems well calculated to promote the growth of climatic meteorology under the auspices of the Society, and should be fostered and extended, provided we do not thereby sacrifice quality of work for quantity. For the public is apt to view with jealousy and disfavour too great centralisation in the sphere of any Government Department, and the Meteorological Council, being practically a Government office, though of a somewhat anomalous constitution, would be peculiarly open to this charge, owing to its specialty of function and irresponsibility of action. Under the existing salutary arrangements, however, the Government has the advantage of being able to ascertain, through the medium of this Society, the wishes of the public, to enlist its goodwill and sympathy, and to obtain the results of the voluntary labours of meteorologists. For there is no restriction to our Fellowship; every meteorologist is welcome to our ranks, and may thus acquire a voice in our affairs, and exert a personal influence in our

councils in a manner attainable by no other means. On the other hanc Meteorological Council has to some extent carried on inquiries beyon power of our Society to undertake, though of great importance to the prc of meteorology generally and to us specially, as affording a basis for th velopment of the knowledge of the climate of the British Isles, which is as y from perfect. These inquiries properly fall under the supervision of the M rological Council, and their pursuit should be encouraged by us to the ut

Passing over Maritime Meteorology and Storm Warnings, on whic government of a country like our own suitably expends its resources, I perhaps be permitted to criticise one or two points of the work o Meteorological Council. For example, it seems questionable whether th production and publication year after year of the curves produced by the registering instruments of the principal observatories is worth the labou expenditure incurred. The process may possibly lead to the eliminatior few errors in tabulating the numerical values taken from the automatic cu scarcely to anything else; and although the curves thus projected may cc to the mind a general idea of concurrent phenomena, I cannot conceive the be a fit subject for serious study. More likely they will be relegated to obli

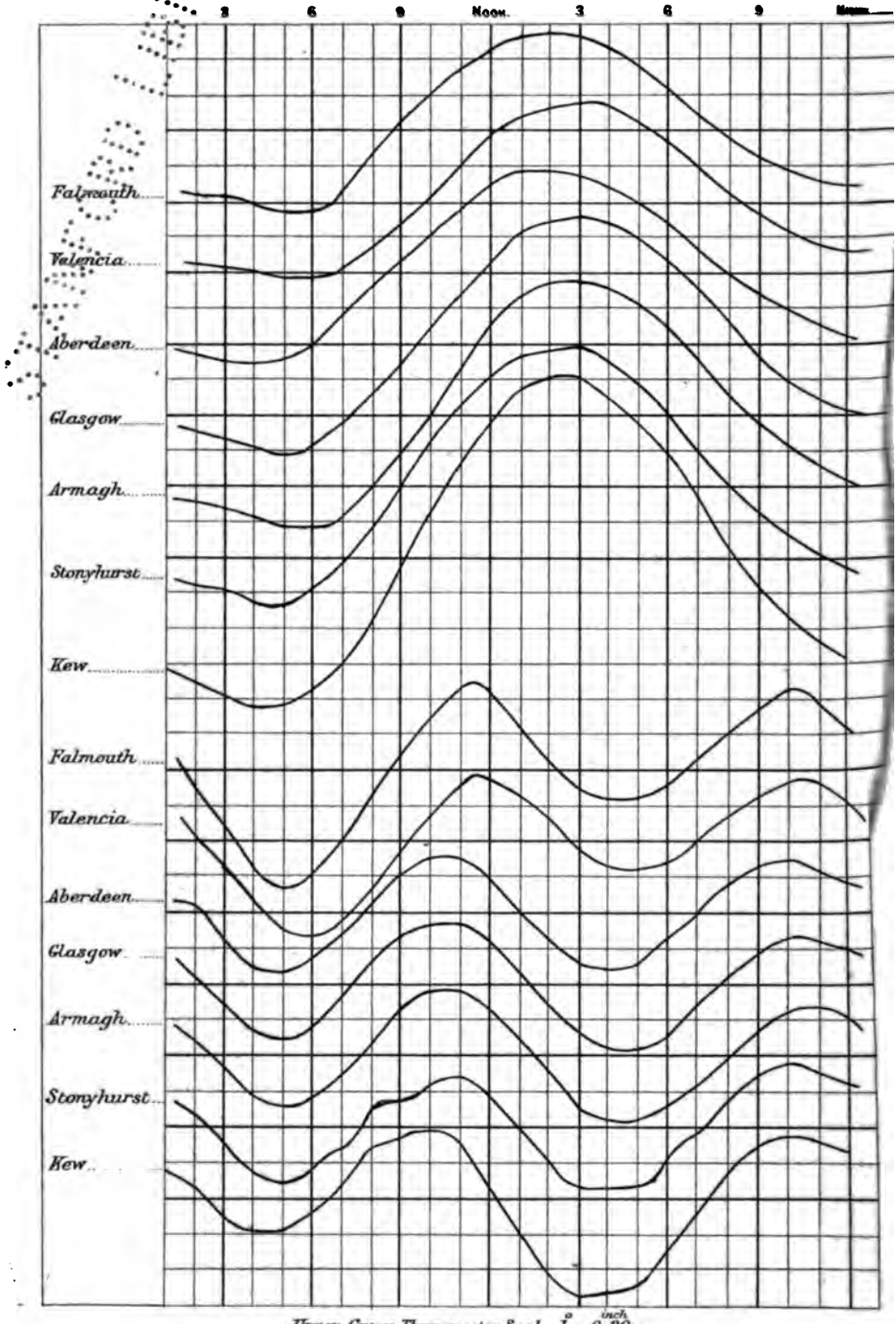
Again, I think the labour bestowed in estimating hygrometrical results the dry and wet bulb thermometers is to a great extent labour in vain that it would be better expended in endeavouring to perfect the theo evaporation by suitable experiments. The action of the hygromet confessedly uncertain when the air is very dry or the temperature belo freezing point of water; moreover, the instrument requires sedulous care attention at all times. I should, therefore, hail with satisfaction diminution in the present large amount of calculations of hygrome results undertaken both by the Meteorological Council and by our Societ

Having, then, with all due deference suggested these modifications i work of the Meteorological Council, it gives me much pleasure to refer to valuable tables of hourly readings of the automatic instruments publishe the Council. These are all the more valuable, inasmuch as they are the unvarnished record of observation, no attempt being made to supply fa of registration or to slur over other defects. It is true that the photogra trace sometimes disappears, that a fall of snow interferes with the registr of the rain gauge, that the action of the wet-bulb thermometer is uncer and that the delicacy of the anemometer is apparently affected by frict but these are difficulties which it is to be hoped may ultimately be overc The candour with which they are admitted augurs well for the future; an any case the published series, now extending over more than three years the seven stations, is probably the best extant.

Although hardly in accordance with the usual course of our proceedin an anniversary meeting, I cannot forbear trespassing upon your indulgenc far as to impart some interesting deductions obtained from the hourly rec of the barometer and thermometer at the above mentioned observatorie the year 1876. The results are shown in the accompanying tables curves for every month and for the year, and are the first-fruits of a so

MEAN DIURNAL VARIATION OF THE THERMOMETER AND BAROMETER 1876.

(Local Time.)



Upper Curve Thermometer, Scale $1^{\circ} = 0{\cdot}20^{inch}$

Lower . . . . *Barometer,* . . . . $0{\cdot}01^{inch} - 1{\cdot}00$

Time. . . . . $1^{hour} = 0{\cdot}16$

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what tedious undertaking which I hope to complete of the various elements of observation for that year. A description of the observatories, of the instruments, and of the system of registration has been published by the Meteorological Office. The hours of observation are Greenwich mean time, and in comparing the tables and curves allowance must be made for the difference of local time to be able properly to contrast the features of diurnal range peculiar to each station. In drawing a comparison between the curves, I have referred them all to local time. Deficient observations have been provided for by interpolation, and the averages for the year therefore represent the mean of 366 values.

To begin with the barometer, a brief examination of the curves (Plate II.) shows that the combined diurnal and semidiurnal variation of atmospheric pressure tends to follow one of two distinct types. In one of them the minimum of pressure is most pronounced in the morning, in the other in the afternoon. These, in the British Isles, are respectively types of a maritime climate and of an inland one. And in the maritime climate, where the atmospheric pressure is most feeble in the morning, the forenoon maximum is postponed to a later hour. Thus at Kew, the most continental in its type of all the stations, the barometer attains its maximum at 9.55 a.m., or 1 hour 45 minutes earlier than at Valencia, and 1 hour 25 minutes earlier than at Falmouth, the two latter stations being fully exposed to the Atlantic.

At the inland station of Armagh, which is about 230 miles from Valencia, almost the same distance as Kew from Falmouth, the maximum occurs at 10.35 a.m., being 1 hour 5 minutes earlier than at Valencia.

Now if the stations be arranged in order according as the atmospheric pressure at sea level in the morning is comparatively less than the pressure in the afternoon, the same arrangement will be found to obtain in respect of the amplitude of their diurnal variation of temperature, the range being least at the maritime and greatest at the inland stations. To this rule there is no exception. The order in which they stand and the numerical values are respectively :—

	Falmouth.	Valencia.	Aberdeen.	Glasgow.	Armagh.	Stonyhurst.	Kew.
Morning minimum pressure differs from afternoon	In.	In.	In.	In.	In.	In.	In.
	—0·011	—0·009	+0·001	+0·005	+0·006	+0·008	+0·010
Range of Thermometer	4°·8	5°·0	5°·6	6°·7	6°·9	7°·2	9°·3

But a source of uncertainty is introduced in comparing the ranges of the thermometers, owing to their different heights above the surface of the ground, the range of temperature diminishing with elevation to an unknown extent. This, however much to be regretted, would probably not affect the above order if allowed for, although at Aberdeen the height of the thermometer above the ground is considerable, and it may be proper for the present to exclude this station from further comparison with the rest. With this reservation, it will be seen that proximity to the sea retards the hour at which the minimum temperature is reached. At Falmouth the minimum temperature is attained at 5.50 a.m., Valencia 5.45 a.m., Armagh 5.35 a.m., Glasgow 5.20 a.m., Stonyhurst 4.35 a.m., and Kew 4.20 a.m.

Beyond this point I have not at present pursued inquiry, and must the fore bring my remarks abruptly to a close. But I cannot conclude with expressing my belief that a careful study of the facts collected by our Soc and by the Meteorological Council will lead to a steady advance in knowledge of the laws of Meteorology.

APPENDIX.

TABLE I.—Particulars relating to the Stations.

Station.	N Latitude.	W Longitude.	Greenwich in advance of Local Time.	Barometer above Sea Level.	Thermometer above Ground
	° ′	° ′	Min.	Ft.	Ft.
Valencia	51 55	10 18	41	23	12
Armagh	54 21	6 39	27	207	4
Glasgow	55 53	4 18	17	184	7
Aberdeen	57 10	2 6	8	89	41
Falmouth	50 9	5 4	20	211	11
Stonyhurst ..	53 51	2 28	10	361	7
Kew	51 28	0 19	1	34	10

TABLE II.—Difference of Dry Bulb Thermometer from the Average; and Avera Temperature for the Year.

1876. Greenwich Mean Time.	Valencia.	Armagh.	Glasgow.	Aberdeen.	Falmouth.	Stonyhurst.	
	°	°	°	°	°	°	
1 a.m. ..	—1·65	—2·31	—2·30	—2·07	—1·66	—2·60	—
2 „ ..	—1·74	—2·55	—2·59	—2·31	—1·83	—2·88	—
3 „ ..	—1·89	—2·75	—2·80	—2·53	—1·85	—2·98	—
4 „ ..	—2·02	—2·99	—2·99	—2·62	—2·10	—3·24	—
5 „ ..	—2·04	—3·12	—3·04	—2·39	—2·17	—3·21	—
6 „ ..	—2·01	—3·08	—2·79	—1·97	—2·16	—2·88	—
7 „ ..	—1·47	—2·43	—2·03	—1·15	—1·47	—1·96	—
8 „ ..	—0·93	—1·60	—1·17	—0·57	—0·49	—0·96	—
9 „ ..	—0·18	—0·41	—0·10	+0·34	+0·55	+0·32	—
10 „ ..	+0·61	+0·78	+0·80	+1·08	+1·13	+1·40	+
11 „ ..	+1·55	+2·07	+1·84	+1·87	+1·92	+2·36	+
Noon ..	+2·10	+2·88	+2·52	+2·45	+2·27	+3·11	+
1 p.m. ..	+2·55	+3·55	+3·29	+2·87	+2·66	+3·70	+
2 „ ..	+2·72	+3·84	+3·49	+2·89	+2·64	+3·89	+
3 „ ..	+2·89	+3·81	+3·68	+2·82	+2·62	+3·95	+
4 „ ..	+2·46	+3·39	+3·36	+2·39	+2·16	+3·42	+
5 „ ..	+1·86	+2·82	+2·92	+1·87	+1·66	+2·72	+
6 „ ..	+1·18	+1·96	+2·05	+1·27	+0·90	+1·81	+
7 „ ..	+0·53	+1·17	+1·07	+0·73	+0·30	+0·83	+
8 „ ..	—0·16	+0·24	+0·13	—0·09	—0·43	—0·14	+
9 „ ..	—0·69	—0·53	—0·58	—0·61	—0·81	—0·91	—
10 „ ..	—1·04	—1·15	—1·18	—1·06	—1·15	—1·54	—
11 „ ..	—1·25	—1·61	—1·60	—1·42	—1·31	—1·96	—
Midnight	—1·44	—1·98	—1·99	—1·79	—1·52	—2·35	—
Average..	51·56	48·28	47·12	46·26	51·65	48·11	

TABLE III.—Difference of Barometer Reading from the Average.

5. wich n e.	Valencia.	Armagh.	Glasgow.	Aberdeen.	Falmouth.	Stony-hurst.	Kew.
	In.	In.	In.	In.	In.	In.	In.
1.. ..	+0·0031	+0·0044	+0·0036	+0·0019	+0·0011	+0·0035	+0·0040
..	— ·0033	+ ·0010	+ ·0006	+ ·0006	— ·0043	+ ·0012	+ ·0018
..	— ·0067	— ·0035	— ·0035	— ·0050	— ·0108	— ·0039	— ·0029
..	— ·0116	— ·0068	— ·0066	— ·0073	— ·0154	— ·0067	— ·0046
..	— ·0131	— ·0071	— ·0077	— ·0079	— ·0162	— ·0075	— ·0048
..	— ·0117	— ·0047	— ·0048	— ·0057	— ·0135	— ·0050	— ·0016
..	— ·0080	— ·0017	— ·0007	— ·0023	— ·0081	— ·0030	+ ·0020
..	— ·0026	+ ·0037	+ ·0044	+ ·0028	— ·0015	+ ·0023	+ ·0073
..	+ ·0025	+ ·0071	+ ·0070	+ ·0053	+ ·0035	+ ·0035	+ ·0083
..	+ ·0068	+ ·0091	+ ·0083	+ ·0075	+ ·0083	+ ·0068	+ ·0099
..	+ ·0094	+ ·0086	+ ·0087	+ ·0074	+ ·0120	+ ·0071	+ ·0077
....	+ ·0075	+ ·0049	+ ·0046	+ ·0041	+ ·0091	+ ·0038	+ ·0016
n..	+ ·0047	+ ·0006	— ·0003	— ·0004	+ ·0041	— ·0017	— ·0055
.	+ ·0002	— ·0050	— ·0044	— ·0039	— ·0001	— ·0052	— ·0109
..	— ·0026	— ·0078	— ·0073	— ·0072	— ·0032	— ·0086	— ·0133
....	— ·0041	— ·0094	— ·0094	— ·0077	— ·0040	— ·0088	— ·0129
..	— ·0032	— ·0088	— ·0092	— ·0067	— ·0038	— ·0085	— ·0118
..	— ·0011	— ·0059	— ·0058	— ·0029	— ·0005	— ·0035	— ·0064
..	+ ·0024	— ·0020	— ·0025	·0000	+ ·0025	— ·0006	— ·0019
..	+ ·0048	+ ·0019	+ ·0021	+ ·0042	+ ·0061	+ ·0048	+ ·0043
..	+ ·0078	+ ·0052	+ ·0050	+ ·0063	+ ·0096	+ ·0074	+ ·0074
..	+ ·0088	+ ·0065	+ ·0069	+ ·0073	+ ·0019	+ ·0095	+ ·0092
..	+ ·0067	+ ·0062	+ ·0056	+ ·0057	+ ·0081	+ ·0076	+ ·0080
ight	+0·0030	+0·0044	+0·0047	+0·0045	+0·0052	+0·0059	+0·0061

BLE IV.—Difference of Barometer Reading (reduced to Sea Level) from the Average; and Average of the Barometer Readings for the Year.

76. nwich ean ime.	Valencia.	Armagh.	Glasgow.	Aberdeen.	Falmouth.	Stony-hurst.	Kew.
	In.	In.	In.	In.	In.	In.	In.
.m..	+0·003	+0·006	+0·004	+0·002	+0·002	+0·006	+0·004
..	— ·003	+ ·002	+ ·001	— ·001	— ·004	+ ·004	+ ·002
..	— ·007	— ·002	— ·003	— ·005	— ·010	— ·001	— ·003
..	— ·012	— ·005	— ·006	— ·007	— ·015	— ·003	— ·004
..	— ·013	— ·005	— ·007	— ·008	— ·016	— ·004	— ·004
..	— ·012	— ·003	— ·004	— ·006	— ·013	— ·003	— ·001
..	— ·008	·000	·000	— ·002	— ·008	— ·002	+ ·002
..	— ·003	+ ·005	+ ·004	+ ·003	— ·002	+ ·003	+ ·007
..	+ ·002	+ ·008	+ ·007	+ ·005	+ ·003	+ ·004	+ ·009
.	+ ·007	+ ·009	+ ·007	+ ·007	+ ·008	+ ·006	+ ·010
..	+ ·009	+ ·008	+ ·007	+ ·006	+ ·011	+ ·006	+ ·008
..	+ ·007	+ ·004	+ ·003	+ ·003	+ ·008	+ ·001	+ ·002
m..	+ ·005	— ·001	— ·002	— ·001	+ ·003	— ·004	— ·005
..	·000	— ·007	— ·007	— ·005	— ·001	— ·009	— ·011
..	— ·003	— ·010	— ·010	— ·008	— ·005	— ·012	— ·014
...	— ·004	— ·011	— ·012	— ·009	— ·005	— ·011	— ·013
..	— ·003	— ·010	— ·010	— ·008	— ·005	— ·011	— ·012
..	— ·001	— ·007	— ·007	— ·003	— ·001	— ·005	— ·006
..	+ ·002	— ·002	— ·004	·000	+ ·002	·000	— ·002
..	+ ·005	+ ·002	+ ·002	+ ·004	+ ·006	+ ·005	+ ·005
..	+ ·008	+ ·006	+ ·005	+ ·006	+ ·010	+ ·008	+ ·008
...	+ ·009	+ ·008	+ ·007	+ ·007	+ ·011	+ ·011	+ ·010
..	+ ·007	+ ·007	+ ·006	+ ·006	+ .009	+ ·009	+ ·008
ght	+0·003	+0·006	+0·005	+0·004	+0·006	+0·008	+0·006
ge..	29·843	29·838	29·804	29·812	29·915	29·854	29 904

REPORT OF THE COUNCIL

FOR THE YEAR 1877.

In laying this Report before the Annual General Meeting the Council desire to express their gratification at the increase in the number of the Fellows and Stations of the Society; the greater size of the Quarterly Journal and the higher value placed on it by foreign Scientific Societies; the augmentation of the Library; and the addition to the sum hitherto contributed by the Meteorological Council; as well as at the other evidences of vigour and progress during the year.

In consequence of the numerous matters demanding attention the Council have not only met at the ordinary times, but have held several special meetings, and most of the Committees appointed by the Council have also been called upon for an unusual expenditure of time in carrying out the work deputed to them. These Committees are as follows:—

House Committee.—The President, Secretaries, Dr. Mann, Mr. Bicknell, Mr. Brooke and Mr. Greaves.

Editing Committee.—Dr. Mann, Mr. Laughton and Mr. Scott.

Observation Committee.—The President, Mr. Scott and Mr. Symons.

Library Committee.—The President and Secretaries.

Lightning Rod Committee.—The President, Secretaries, Dr. Mann, Mr. Brooke, Mr. Dymond and Mr. Preece.

The attention of the Council has lately been drawn to a matter of some importance, viz. their power to deal with the invested Funds of the Society without previously obtaining the consent of a General Meeting. The practice hitherto adopted has been to invest the surplus income or sell the stock belonging to the Society as exigencies arose. Thus the balance of assets over liabilities on December 31st, 1874, was £1,169, but although since that date a large sum has been disbursed for the inspection of stations, printing of expensive papers, and of the observations either in full or in abstract taken at its stations, yet the balance on December 31st last amounted to £1,394. Under all the circumstances, however, the Council have deemed it advisable to take the opinion of the Meeting on this point, as they are anxious that their action should be in every way conformable to the wishes of the Society at large.

In connection with this subject the Council have considered the question of investing the Life Composition Fees, and have arrived at the conclusion that it is advisable the total amount invested shall at least represent the sums paid by existing Fellows as Life Compositions. As the sum invested is now in excess of that amount, and as the work of the Society is seriously crippled for want of funds, the Council consider that for the present, subject to the rule above laid down, the Composition Fees should be invested by the Treasurer only on a special order of the Council.

With the view of obtaining suitable names for insertion on the Election Lists, it was resolved, at a recent Council Meeting, to place a foot-note on the notice convening the Ordinary Meeting in December, asking the Fellows at large to suggest any names they desired to see placed on the House List for election of new Officers and Council. This foot-note has led to a response from one Fellow only.

The work of the Office has been carried out in a satisfactory manner; but the pressure upon the staff in making the necessary comparisons and reductions of the observations returned on the Society's forms has been so great that no spare time has remained for other pressing and necessary work. The Council find that more money is required for the payment of an addition to the staff, and this they hope to be able to obtain during the current year. As will be seen by the balance sheet, they have slightly increased the salaries of their employés.

The Council have also to draw attention to the improved condition of the Library, due partly to the purchase of books, several of considerable rarity, partly to the large donations, and partly to the binding of a considerable number of books and pamphlets which were almost inaccessible through being packed in parcels. The shelf accommodation has also been largely increased.

As an additional means of extending the Library, the Council sent out a circular to the Fellows, soliciting subscriptions towards a Library Fund or the presentation of books bearing on meteorological subjects. The Fund is a perennial one, and will consequently not be closed. The request for books has been successful, as will be seen by reference to the lists in the Quarterly Journal. The books purchased are recorded in Appendix IV. There are, however, many works at present in the Library not bearing on meteorological subjects, which it is proposed to get rid of by sale or exchange.

The Exchange List has been revised by the House Committee, and at its suggestion two names have been removed from, and the following added to, the List:—

Budapest	Königl. Ungarische Central-Anstalt für Meteorologie.
Calcutta	St. Xavier's College Observatory.
Edinburgh	Royal Society.
Lisbon	Observatorio do Infante D. Luiz.
Madrid	Sociedad Geografica.
Marlborough	Natural History Society.
Moncalieri	Observatorio del R. Collegio Carlo Alberto.
Rome	Ministero d' Agricultura.
Sydney	Royal Society of New South Wales.
Zürich	Schweizerische meteorologische Central-Anstalt.

A desire having been expressed at the last Annual Meeting that the property of the Society should be insured, the Council have effected the insurance of the Library for the sum of £250 in the Scottish Union Office.

The Papers read before the Society have been both numerous and interesting, and in some cases of exceptional value. In February a short

communication was received from Mr. Miller on "Local Diurnal and as the Council considered that the subject required investiga requested the Assistant-Secretary to prepare a Report on the subje was read at the March Meeting. This Report was rendered valuable by the incorporation, with the permission of the Astronom of the Table of Mean Temperature at the Royal Observatory, Gree every hour of the day during the twenty years 1849-1868.

A Committee was appointed in April to prepare a brief manual of tion regarding the construction of Lightning Rods, and to give in on matters bearing upon the injurious effects of Lightning.

The Quarterly Journal has continued to increase in interest a Vol. III., just completed, contains 496 pages and 22 Plates, b Appendix of 106 pages, or 602 pages in all. Special subscriptions h received towards printing the Plates illustrating the Rev. W. C. I Dr. Marcet's papers in No. 24.

Respecting stations, the only change to note since the last Repo Kelstern has been substituted for Calcethorpe, the observer having his instruments, January 1st, 1877, from the latter place to the distance of about two miles. In addition, three new stations, Bab Mansfield and Norwood, have been organised and accepted; parti these will be found in Mr. Symons's Report in Appendix I. In ance with the arrangement mentioned in previous Reports, copie detailed observations have been supplied to the Meteorological Offi following stations:—

Audley End	J. Bryan.
Babbacombe	E. E. Glyde.
Buxton	E. J. Sykes, F.R.A.S.
Carmarthen	G. J. Hearder, M.D.
Dartmoor	R. E. Power, L.R.C.P.
Hawes	Rev. J. D. Parker, LL.D.
Hereford	T. A. Chapman, M.D.
Hillington	Rev. H. Ffolkes.
Kelstern	D. G. Briggs.
Marlborough	Rev. T. A. Preston, M.A.
Mellington Hall	P. Wright, F.C.S.
Ramsgate	Rev. E. A. D. O'Gara, O.S.B.
Strathfield Turgiss	Rev. C. H. Griffith.
Wakefield	H. Clarke, L.R.C.P.

And monthly results furnished for

Cheadle	J. C. Philips.
Llandudno	J. Nicol, M.D.

Observations have also been received from the following stations:-

Cardiff	W. Adams, Assoc. Inst. C.E.
Caterham	J. Adam, M.D.
Crewkerne	F. J. Sparks.
Eastbourne	S. Bretton.

Hadleigh	J. T. Muriel, M.R.C.S. (deceased).
Jersey	P. Langlois, M.R.C.S.
Mansfield	R. Tyrer, B.A.
Norwood	W. Marriott.
Portland	Col. Akers, R.E.
Shrewsbury	Rev. E. V. Pigott.
Teignmouth	W. C. Lake, M.D.
,,	G. W. Ormerod, M.A., F.G.S.
Watford	J. Hopkinson, F.L.S.
Rossinières, Switzerland	Col. M. F. Ward, F.R.A.S.
St. John's, Newfoundland	John Delaney.

The monthly abstracts of the observations from the fourteen stations supplied to the Meteorological Office for the year 1876, together with the detailed observations from Hawes and Strathfield Turgiss, have been printed in Nos. 23 and 24 of the Quarterly Journal.

On April 20th, the Council forwarded a Memorial under seal to the Lords Commissioners of Her Majesty's Treasury, praying for a grant in aid of the current expenditure of ths Society. The following is an abstract of the Memorial:—

1. The Meteorological Society was established in 1850, and incorporated by Royal Charter in 1866.*

2. The Society consists of 388 Fellows, paying annual subscriptions, or who have compounded, and of 17 Honorary Members.

3. The Society holds meetings for the discussion of Meteorological subjects eight times per annum.

4. A considerable number of the Fellows are really working Meteorologists, and contribute papers to the Society's publications.

5. The Society publishes a Quarterly Journal, which is supplied gratuitously to the Fellows and to a large number of Observatories and Libraries in different parts of the globe.

6. The Society has established a series of meteorological stations in various parts of England and Wales, principally at the expense and under the care of the Fellows. The instruments are all verified, mounted uniformly, observed at the same hours, and the observations are tabulated and reduced in the same manner, and no station is accepted until it has been visited and examined by the Society's Inspector, and a plan drawn of the position of the instruments. Reduced copies of the plan and an abstract of the report are published for general information.

7. In addition to the above the Society, through its paid officer, undertakes and publishes original investigations.

8. Inasmuch as its entire income is less than £500 per annum, the action of the Society is much crippled, and but for the assistance of the Fellows it would be impossible to continue its present operations.

9. The Society has since January 1st, 1875, supplied to the Meteorological

* A Society with similar objects was organised in 1823.

Office the results from 14 of its stations, at a charge merely calculated to cover the expense of copying—the Society having borne all the cost of inspecting the stations and of the labour requisite for verifying and reducing the observations.

10. The Council have considered the Report of the Treasury Committee upon the mode of administering the annual grant in aid of Meteorology, and the proposals contained therein, and beg to submit that in view of the facts above set forth, and especially of those contained in paragraphs Nos. 6 and 9, the Society is fairly entitled to favourable consideration.

On June 14th, a reply was received from the Treasury to the effect that "My Lords" had agreed with the Royal Society for the creation of such a Committee or Council as was contemplated in the 9th paragraph of the Report of the Treasury Committee, and that as regards aid to particular Meteorological Societies "My Lords" intended to adhere strictly to the recommendation in the 23rd paragraph of the Report, to the effect that no payments should be made to such bodies except for results sought for by the new Council, which in the 22nd paragraph has its attention directed to the importance of fostering local co-operation to the utmost.

Finding that the sum paid by the Meteorological Council for copies of the observations was less than the actual cost to the Society for their reduction, &c., application was made to that body for a reconsideration of the arrangement entered upon in 1874, and an increase in the payment per station, as well as a grant of a separate sum towards the cost of inspection. In response to this request, the Meteorological Council have agreed to increase the sum by £80 for the financial year ending March 31st, 1878; and are disposed to reconsider the previous arrangement, especially as regards a vote towards the Society's expenditure in periodically inspecting the stations.

In connection with this and other cognate subjects, the Council held a special meeting on December 4th, when the following resolutions were agreed to, viz.:—That the stations from which returns are sent to the Meteorological Council be continued; that all other accepted and inspected stations be continued; but, that considering the financial condition of the Society, the Council regret that they do not feel justified in accepting any fresh returns which will increase the expenditure. As the stations offered are considered to be much needed, and as the discussed returns, when published, would add materially to the usefulness of the Society, a special appeal has been made to the Fellows for funds to enable the Council to carry out the work.

The Council, having had brought before them the question whether ladies can become Fellows, have resolved to recommend to the Annual Meeting that Ladies be admitted as Fellows of the Society, and that the Bye-Laws be altered accordingly.

The returns of Phenological Phenomena have been received from some of the Fellows and several other persons, and forwarded to the Rev. T. A. Preston, who has charge of this department. The Report, which was read at the Meeting in December, is contained in the January Number of the Quarterly Journal.

The following instruments have been exhibited at the Meetings during the past Session:—

Barometrical and Thermometrical Clocks. By W. F. Stanley.

Solar Thermo-Radiometer.
Improved Minimum Thermometers for Terrestrial Radiation. } By J. J. Hicks.

Apparatus for recording Hourly Temperatures.
Solar Radiation Thermometer with new test gauge.
Terrestrial Radiation Thermometer with protected scale.
New Sea Thermometer for shallow depths. } By Messrs. Negretti and Zambra.

New form of Solar Thermometer. By Commander E. Bourke, R.N.

The Diéthéroscope. By Prof. J. Luvini.

Thermometers for observing Earth Temperature. By G. J. Symons.

New form of Hygrometer.
Standard Siphon Barometer. } By F. Bogen.

Thermometer with false bores. By H. C. Russell, B.A., F.R.A.S.

There has been a continuous increase in the number of Fellows, and the total now reaches 417. The following figures show the progress during the past five years:—

1873, December 31st,	...	...	...	308
1874, ,,	...	...	...	327
1875, ,,	...	...	...	358
1876, ,,	...	...	...	398
1877, ,,	...	...	...	417

The Society has to regret the loss by death of five of its Fellows, and one of its Honorary Members, viz.:—

George Clayton Atkinson, elected into the Society,		May 7th, 1850.
Donald Butter, M.D.,	,,	June 18th, 1862.
John Peter Gassiot, D.C.L., F.R.S.,	,,	June 15th, 1864.
William Reynolds, M.D.,	,,	August 7th, 1850.
Charles Tarrant, M. Inst. C.E.,	,,	May 17th, 1876.
Urbain Joseph Le Verrier,	,,	February 21st, 1877.

The following tabular statement shows the present number of the Fellows, Honorary Members, and the changes during the past year:—

	Life.	Ordinary.	Honorary.	Totals.
1876, December 31 ...	87	295	16	398
Since elected	+4	+33	+1	+38
Deceased	—2	— 3	—1	— 6
Retired	...	— 9	...	— 9
Defaulters	...	— 4	...	— 4
1877, December 31 ...	89	312	16	417

The Balance Sheet (Appendix III.) shows that after investing £60 in New 3 per Cents. the sum to the credit of the Society on December 31 was

£83 15s. 5d., against £44 8s. 10d. on Dec. 31, 1876, and that £453 14s. 7d. were expended. The items of expenditure are as follows:—On the Journal, £163 7s. 6d.; on general printing and book binding, £31 19s. 8d.; on salaries, £160 2s.; on office expenses, refreshments and petty expenses, £72 15s. 11d.; and on inspection of stations and forms for observations, £25 9s. 6d. The receipts amounted to £553 1s. 2d., which were derived from the following sources, viz. £41 16s. 10d. from dividends; £118 6s. 8d. from the Meteorological Office; £312 13s. 3d. from subscriptions; £60 from life compositions; £15 4s. 5d. from sale of publications; and £5 from special contributions. The donations to the Library Fund of £3 2s. have have not been brought into the account. The assets consist of £1,105 2s. invested; of £132 due for subscriptions and entrance fees; of £37 0s. 6d. for Dividends due and Contributions promised to Mr. Ley's and Dr. Marcet's Papers; of £50 on the value of furniture and instruments; and of £83 15s. 5d. in hands of Bankers and Assistant-Secretary. To these might be added the value of the Library, on which a considerable sum has been expended. The liabilities consist of £5 1s. for subscriptions paid in advance, and £9 to printers for stereo-plates of observations for 1876.

APPENDIX I.

Report of Mr. Symons on the Inspection of the Stations.

Babbacombe, Torquay.—Inspected August 22nd.

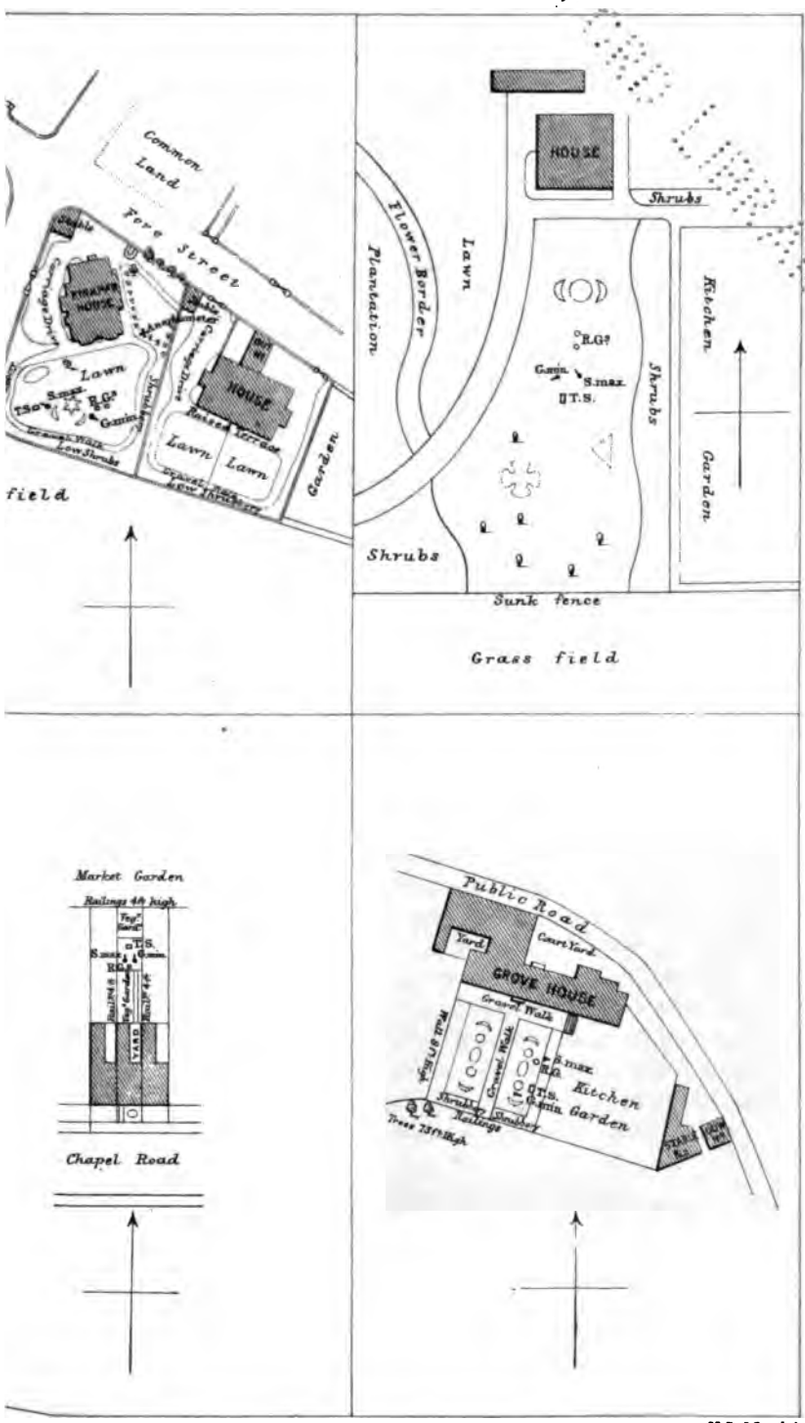
Mr. Glyde, F.M.S., had contributed observations to the Society until his removal from Forest Hill, and offered to continue to report from his new residence in the suburbs of Torquay. All his instruments are verified ones of the best pattern, but one of the mercurial thermometers has changed its error very rapidly, and in an unusual direction; the wet bulb was 0°·2 too low when compared at Kew in the spring of 1876, it was 0°·5 too low in July, 1877, and 0°·6 too low at the time of inspection. Fortunately, Mr. Glyde has duplicates of nearly all his instruments, and, therefore, this change will be carefully watched. As will be seen from the plan, the station is very fairly open, and on the whole I think that the observations may be accepted as accurately representing the climate of the upper part of Babbacombe, and, to a certain extent, the higher parts of Torquay.

Buxton.—Inspected September 25th.

This station was found in perfect order, except in the following respects:—The solar-radiation thermometer had been found by the observer to show on two occasions a lower maximum temperature than that given by the maximum thermometer in the Stevenson's stand. On examination, it appeared that the detached or index portion of the column had become much too long, and that, consequently, the thermometer on the occasions referred to had not acted as a maximum, and the temperatures read were the actual tempera-

BARRACOMBE.

KILSTERN.



LOWER NORWOOD.

MANSFIELD.

SCALE

0 60 120 feet

Property of Library

tures at the time of reading. A new thermometer has been ordered by the observer, and instructions given for its comparison with the Society's standard before despatch. The upper part of the measuring glass of the rain-gauge glass had been broken, and a new verified one ordered. The thermometer stand was getting dirty, and I recommended that it be repainted.

KELSTERN, LOUTH.—Inspected September 28th.

This station is a very short distance, perhaps one mile, north of the one previously reported upon at Calcethorpe. Mr. Briggs's new residence is more sheltered than the previous one; but although there are several trees on the lawn and a belt at the back and side of the house, there are none which have any injurious effect, except in rendering it impossible to use the anemometer, and perhaps slightly affecting the wind observations. All the instruments were in perfect order.

LOWER NORWOOD.—Inspected October 1st.

Mr. Marriott, the Assistant-Secretary, resides at Lower Norwood, about five miles south of St. Paul's Cathedral, and two miles west of the Crystal Palace. The neighbourhood is not closely built, and there is a large cricket field and market garden due north of his house. The situation may, therefore, be regarded as fairly representative of the higher land (190 feet above sea) in the South of London almost uninfluenced by habitation. It has often been suggested that the Society ought to have a station representing the climate of London, though whether that of London itself or of the locality in which it is situated has not been stated. However, Mr. Marriott offered to keep regular observations if some of the Society's instruments were lent to him, and having added to them several of his own, so as to fully equip the station, I inspected it on the above date, and found, as might have been expected, all the arrangements as satisfactory as possible.

MANSFIELD.—Inspected September 28th.

This station is on the outskirts of the town, and very open to the south; the ground is nearly level, falling a little to the east; the flower garden in which the instruments are placed is (as will be seen by the plan) not large, but it is only separated by a slight fence from a large field on the south and vegetable garden on the east. The observers seem very careful, and regular readings are taken at 9 a.m. and 9 p.m. The station requires to be provided with a Stevenson's thermometer stand, and a new grass minimum thermometer. The barometer is a very fine one, and the other instruments will all, I think, be sufficiently good.

BROOKBANK, TEIGNMOUTH.—Inspected August 30th.

The instruments are good, and placed in the garden south-west of Mr. Ormerod's house. The thermometers are attached to a species of Glaisher stand, or, perhaps more properly, to a variety of Martin's; they are attached to a vertical board in front of a summer-house, and face due north; they are sheltered by trees, &c., from the sun, and, though not mounted uniformly with the instruments at the rest of the Society's stations, doubtless give nearly

accurate results, the range being probably rather too large. On comparing the thermometers with my standard, the errors appeared to be at 62°: Dry, +0°·8; Wet, +0°·8; Max. +0°·4; Min. −0°·7;—thus indicating (what seems to be a frequent occurrence) that the tubes had been graduated too soon after filling. The barometer appeared to be a very good one. As the observer cannot take 9 p.m. observations, the full inspection form was not filled up.

THE BITTAN, TEIGNMOUTH.—Inspected August 30th.

Dr. Lake, finding his own garden too small and too sheltered for accurate observations, has, by permission of the owner, placed the thermometers in the large grounds of The Bittan, which slope gently towards the River Teign, which forms their southern boundary. His rain-gauge was also placed there for some time, but the accuracy of the observations was questioned; it was said that the ground sloped too much for the results to be trustworthy, and eventually Dr. Lake removed the gauge to the side of the Water Works Reservoir. I do not concur in the objections raised against this site; and I consider that if Dr. Lake could arrange for 9 p.m. observations in addition to the present 9 a.m. ones, and would restore his rain-gauge to its old position, or put a new one there, that all the requisites of a satisfactory station would be supplied.

WAKEFIELD.—Inspected September 26th.

Dr. Clarke happened to be away from home, but Warder Brown was in charge of the station, which was in very good order. There has been no change in the instruments or their position since the last inspection, except that the barometer has been protected by a glass case. The grass upon which the radiation minimum thermometer is placed was rather too long, and I gave orders for it to be cut, and suggested that the thermometer stand should be painted. In all other respects the station was in perfect order.

APPENDIX II.

OBITUARY NOTICES OF FELLOWS DECEASED.

JOHN PETER GASSIOT was a noble specimen of a class of man which rare indeed in this country, and almost utterly unknown outside of it, w amongst the varied engagements of a busy commercial life, found leisure win for himself a leading position in the scientific world.

That a midshipman in the Royal Navy should become a prominent m chant of London, foremost in all works of social improvement in the C and the virtual founder of the Middle Class School; that he should h been the intimate friend of Faraday, the constructor of the first really la galvanic battery, and the painstaking investigator of the brilliant resu afforded by it,—is surely no mean tale of work for one life.

He joined the Society in 1864, and though he never contributed a papers to our Journal, all British Meteorologists owe him a deep debt

gratitude for the organisation of the verification system of Kew Observatory, over which establishment he long presided as Chairman of the British Association Kew Committee.

In the last years of his life he had withdrawn from business and from science, and he passed away quietly at his country seat at Ryde, on the 18th of August, in the 81st year of his age.

URBAIN JEAN JOSEPH LEVERRIER was the man to whom in the first place is due the credit of proposing to a European Government the organisation of a Weather Telegraphic System. February 17th, 1855, was the day on which he received the Emperor's sanction for the creation of the French Reporting System, which now, after 23 years, bears the impress of its first founder.

It is beyond the powers of one man to remain at the head of two sciences so extensive and absorbing as Astronomy and Meteorology, and it would ill beseem us to presume to speak of his labours in the former sphere of knowledge. We can only as Meteorologists regret that, beyond having created the system of the *Bulletin International*, and founded the *Association Scientifique de France*, with the main object of forwarding our Science by the preparation of his *Atlas des mouvements généraux de l'Atmosphère*, and the successive volumes of his *Atlas Météorologique de France*, the literature of Meteorology will hardly show a trace of the name of one who influenced it so importantly. He was elected an Honorary Member on February 21st, and he died on September 23rd, 1877, in the 66th year of his age.

AP

Abstract of Receipts and Expen

Receipts.

		£	s.	d.	£
Jan.	Balance from last year				44
Jan.	Dividend on £800 M. S. & L. R. 4½ Debenture Stock	17	15	6	
April	Do. £212 5s. New 3 per Cents.	3	2	11	
July	Do. £800 M. S. & L. R. 4½ Debenture Stock	17	15	6	
Oct.	Do. £212 5s. New 3 per Cents.	3	2	11	
					41 1
	Meteorological Office.—Copies of Returns from 3 stations—January to June, 1876	7	10	0	
	Do. Copies of Returns from 9 stations, July to December, 1876	22	10	0	
	Do. Copies of Returns from 14 stations, January to October, 1877	58	6	8	
	Do. Additional payment, April to October, 1877	17	10	0	
	Do. Monthly Summaries from 5 stations for 1876	12	10	0	
					118
Dec.	Subscriptions for 1874	5	1	0	
	Do. for 1875	11	1	0	
	Do. for 1876	34	10	0	
	Do. for 1877	223	17	3	
	Do. for 1878	5	1	0	
	Entrance Fees	33	3	0	
	Life Compositions	60	0	0	
					372
Dec.	Rev. W. C. Ley—Contribution towards the cost of printing Plates of Upper Currents				5
Dec.	Sale of Publications				15
					£597

PENDIX III.

for the Year ending December 31st, 1877.

Expenditure.

	£ s. d.	£ s. d.
Journal—		
Printing Nos. 21—24	95 17 0	
Illustrations	40 4 6	
Authors' Copies	11 5 6	
Printing Observations	9 4 6	
Registrar-General's Reports	6 16 0	
		163 7 6
Printing, &c.—		
General Printing	12 1 6	
Stationery	8 11 5	
Books and Bookbinding	16 6 9	
		31 19 8
Salaries—		
Assistant Secretary	130 0 0	
Computer	28 12 0	
Preparation of Report on Diurnal Range	1 10 0	
		160 2 0
Office Expenses, &c.—		
Rent and Housekeeper	28 10 6	
Coals, Furniture and Insurance	6 3 5	
Postage and Receipt Stamps	20 11 0	
Refreshments	10 14 4	
Expenses incurred at the Loan Exhibition, South Kensington	0 17 6	
Parcels and Petty Expenses	5 19 2	
		72 15 11
Observations—		
Inspection of Stations	12 15 0	
Forms for Meteorological and Phenological Observations	12 14 6	
		25 9 6
Stock—		
Purchase of £62 5s. New 3 per Cents.		60 0 0
		513 14 7
Balance at Bank of England, December 31st	79 10 8	
Do. in hands of Assistant Secretary	4 4 9	
		83 15 5
		£597 10 0

HENRY PERIGAL, *Treasurer.*

Examined and found correct,

E. G. ALDRIDGE,
R. STRACHAN, } *Auditors.*

January 4th, 1878.

APPENDIX III.—*Continued.*

Abstract of Assets and Liabilities for the Year ending December 31st, 1877.

Liabilities.	£	s.	d.
To Subscriptions for 1878 paid in advance	5	1	0
„ Printers for Stereo Plates of Observations for 1876	9	0	0
	14	1	0
„ Excess of Assets over Liabilities	1393	16	11
	£1407	17	11

Assets.	£	s.	d.	£	s.	d.
By Society's Money invested in New 3 per Cents., £212 5s., at 94¼	201	2	0			
„ Society's Money invested in M. S. and L. R. 4½ Debenture Stock, £800, at 113	904	0	0			
				1105	2	0
„ Subscriptions of the year, uncollected	77	10	0			
„ Do. former years, unpaid	43	10	0			
„ Entrance Fees, unpaid	11	0	0			
„ Dividend on £800 M. S. and L. R. 4½ Debenture Stock	17	15	6			
„ Contributions towards printing Plates in Rev. W. C. Ley's and Dr. Marcet's Papers	19	5	0			
				169	0	6
„ Furniture, Fittings, &c.	25	0	0			
„ Instruments	25	0	0			
				50	0	0
„ Cash in hands of Bank of England, December 31st	79	10	8			
„ Do. Assistant Secretary	4	4	9			
				83	15	5
				£1407	17	11

E. G. ALDRIDGE, } *Auditors.*

APPENDIX IV.

List of Books Purchased.

ANONYMOUS.—Frostiana (1814); Printed on the Ice on the Thames.—La Lune et son influence supposée sur le Temps.—Patria, Vols. I. and II., containing an article on Meteorology, by Prof. C. Martins.

BADDELEY, P. F. H.—Whirlwinds and Dust-Storms of India.

BIOT, M.—Tables Barométriques portatives (1811).

BRAVAIS, Lieut. A.—Mémoire sur les Halos et les Phénomènes optiques qui les accompagnent.

CLARK, Sir J., M.D.—The Sanative Influence of Climate.

CLOS, Dr. J. A.—Nouvel Aperçu sur la Météorologie.

COLLIN, A.—Atmidométrie.

COTTE, Le Pere.—Traité de Météorologie (1774).

DALTON, Dr. J., F.R.S.—Meteorological Observations and Essays.

DANIEL, J. F., F.R.S.—Meteorological Essays and Observations. Second Edition.

DE LA CONDRAYE, M.—Théorie de Vents et des Ondes.

DE LUC, J. A.—Idées sur la Météorologie. Tomes I. et II. (1787).

DE MARIAN, M.—Traité physique et historique de l'Aurore Boréale. Second Edition (1754).

DE SAUSSURE, Prof. H. B.—Essais sur l'Hygrométrie.

DOVE, Dr. H. W.—Die Verbreitung der Wärme auf der Oberfläche der Erde.

DREW, Dr. J.—Practical Meteorology.

FRON, E.—Etude sur les Orages dans leurs Rapports avec les Mouvements généraux de l'Atmosphère.

HARRIS, Sir W. Snow, F.R.S.—Thunderstorms.

HARVEY, G., F.R.S.—Meteorology.

HOMERSHAM, S. C.—Supply of Surplus Water to Manchester, &c.

HOWARD, Luke, F.R.S.—Essay on the Modifications of Clouds. Third Edition, 4to.

HUDSON, J.—Hourly Observations and Experimental Investigations on the Barometer.

JONES, T.—Companion to the Mountain Barometer.

KAEMTZ, L. F.—Meteorology. Translated by C. V. Walker, F.R.S.

LE FRANC, Le Pere.—Essais sur la Théorie des Atmosphères (1819).

LOWE, E. J., F.R.S.—Prognostications of the Weather.

MARTIN, Dr. G. A.—The "Undercliff" of the Isle of Wight: Its Climate, History, and Natural Productions.

MARTINE, Dr. G.—Construction and Graduation of Thermometers.

MILLS, J., F.R.S.—An Essay on the Weather.

ORR'S Circle of the Sciences—Astronomy, Navigation, Meteorology.

PELTIER, A.—Mémoire sur les diverses Espèces de Brouillards.

PERRIN, P.—Etude sur les Eclairs.

PIDDINGTON, H.—The Sailor's Horn Book. Second Edition.

POINTER, Rev. J.—A Rational Account of the Weather (1723).

PRESTEL, Dr. M. A. F.—Die jährliche Veränderung der Temperatur der Atmosphäre in Ostfriesland.

QUETELET, A.—Météorologie de la Belgique comparée a celle du Globe.

RAMOND, Le.—Mémoires sur la Formule barométrique de la mécanique Céleste.

READ, J.—A Summary View of the Spontaneous Electricity of the Earth and Atmosphere (1793).

RENNEL, Major J., F.R.S.—Investigation of the Currents of the Atlantic Ocean.

SAUL, E., M.A.—Historical and Philosophical Account of the Barometer.

SCORESBY-JACKSON, Dr. R. E.—Medical Climatology.

SOLARO, Prof. J. M. S.—Récherches sur les Causes et les Lois des Mouvements de l'Atmosphère.

THOMSON, Dr. A. S.—Observations on the Influence of Climate on Health and Mortality.

TOALDO, J.—Essai Météorologique sur la veritable Influence des Astres des Saisons et Changemens de Tems (1784).
TOMLINSON,—The Mist and the Dew-drop.

APPENDIX V.

THE METEOROLOGICAL OFFICE: Robert H. Scott, M.A., F.R.S., Secretary.—The constitution of the Office has been entirely remodelled during the year, in accordance with the recommendations of the Treasury Committee mentioned in the last Report of the Society's Council, which recommendations were laid before Parliament in the month of February, 1877.

The correspondence which passed between the Treasury, the Admiralty and the Royal Society as to the future reorganisation of the Office has been published as a Parliamentary Return (No. 351, 1877). The general outcome of these negotiations has been that, as the Admiralty declined to undertake the management of the Marine Branch of the Office unless under the conditions of a material addition to its present cost—a condition which the Treasury were not prepared to sanction—the Royal Society was requested to nominate a Meteorological Council to take the place of the former Meteorological Committee of the Royal Society. The Treasury declined to appoint the Council, but stated their readiness "to express a formal approval of the selection."

This Council, although nominated by the Council of the Royal Society, is entirely independent of that body; in fact, in a letter of the Treasury to the Royal Society (dated June 28th, 1877), it is expressly stated—

"My Lords entirely concur in the view taken by the Council of the Royal "Society as to the exclusive responsibility of the new Council for its Annual "Report. The part of the Council of the Royal Society is clearly understood "to be confined to that of assisting and advising my Lords by means of such "observations on the Council's Report as it may be found to suggest." (*sic.*)

The Council consists of five members nominated by the Royal Society, with one *ex officio* member, the Hydrographer, nominated by the Admiralty.

The Council is paid, and the title of their chief executive officer is Secretary, instead of Director of the Office.

The vote to the Office was increased by £2,000 during the current financial year, and it is hoped that a further increase will be accorded in the ensuing year.

The most important modifications which are to be introduced into the system of the Office are the nomination of two Inspectors, to act for the Scotch and Irish Stations respectively—only one of whom (Mr. Buchan) has as yet been appointed—and the direct allocation of a sum of money for the purpose of "special scientific researches."

The Council took charge of the Office on the 9th of July.

Marine Meteorology.—The work on the Meteorology of the Equatorial Region of the Atlantic has been issued to the public.

The discussion of the existing materials for the district lying near the Cape of Good Hope is being steadily pursued, but no decision as to the proposed form of publication has as yet been taken.

The Atlas of Synoptic Charts for the North Atlantic for the month of August, 1873, with its accompanying Remarks, is in the press, and will shortly appear. It may be expected to throw some light on the possible origin and character of cyclonic storms. An abstract of this work, in the form of a lecture, delivered by Captain Toynbee at the Royal United Service Institution in May last, has appeared in the Nautical Magazine for December.

The Annual Report of the Office for the year 1876 contains a series of twelve charts, showing the distribution of the materials in the Office for the entire ocean and for each month. The districts now under discussion in various countries were exhibited in the illustrations to a paper by Mr. Scott in the last vol. of the Quarterly Journal of the Society.

Weather Telegraphy.—There has been no material change in this service during the year. In the month of May the Sunday service, which had been tentatively organised by the Meteorological Committee, was stopped by orders of

the Treasury, but it was again resumed in July on the reconstitution of the Office.

The very satisfactory relations which have now for two years existed with the 'Times' are unimpaired, and, thanks to that journal, as explained last year, the service of storm warnings has been carried out with increased efficiency, owing to the facilities afforded for the issue of warnings in the evenings.

An important step is contemplated by the Council, with the view of rendering the information collected by them available for agricultural purposes. It is proposed to issue weekly notices of Temperature and Rainfall for various districts of the United Kingdom (ten in number), showing how the amounts differed from their respective averages for the last ten years. These notices will appear in the newspapers, and a Weekly Weather Report will be issued by the Office, showing the actual values for each station.

The reports on which these returns will be based are to be received by post. The Office has expressed its warm thanks to the Council of the Meteorological Society for permission to obtain reports from some of its stations in connection with this new service.

Land Meteorology.—There are no changes of importance in connection with the seven observatories.

The returns from the Stations of the Second Order, which appear in the Quarterly Weather Report, are increasing in number, and the relations with the Society with reference to these continue as friendly as in previous years.

The number of stations whence returns are now being printed is—

	Detailed Observations with Monthly Abstracts.	Monthly Abstracts only.
1876	15	14
1877	23	9

Royal Observatory, Greenwich. Sir G. B. Airy, K.C.B., F.R.S., Astronomer Royal.—The meteorological work of the Magnetical and Meteorological Department has undergone no important change during the past year. The photographic processes, the eye observations for determination of photographic zeros, and the automatic registration of the direction, velocity and pressure of the wind, are continued as before. The daily registration of the duration of sunshine by means of the instrument devised by Mr. J. F. Campbell, F.G.S., is now continued as part of the regular meteorological work.

It was remarked in the last Report that the amount of rain collected by the new gauge placed on board the police ship 'Royalist,' near Blackwall, was, on the whole, much less than that collected on the ground at the Royal Observatory. The same difference is found to exist in the year just closed, the yearly amounts collected at the two places being in the ratio of 4 to 5. The rain-gauges have been examined, and the measuring vessels tested, so that the observed difference appears to be real.

The August meteors were well observed, but few only were seen in November.

An important comparison between the Standard Barometers of the Greenwich and Kew Observatories has been carried out during the past year, under the direction of Mr. Whipple, of the Kew Observatory. Several portable barometers were brought to Greenwich on three different occasions. The final result has not yet been communicated, but it is understood that the agreement between the two standards is such that their indications may be taken as practically identical.

The Electrometer on Sir William Thomson's plan for photographic record of the indications of atmospheric electricity has been received from Mr. White, and a cistern has since been prepared for use with the Electrometer, but the instrument has not yet been brought into regular work.

The discussion of the photographic thermometer records, 1849 to 1868, of the photographic barometer records, 1854 to 1873, and of the eye observations of the ground thermometers, 1847 to 1873, are now complete, and the results await only printing. Tables of the diurnal inequalities for each month for the Barometer and for the Dry Bulb Thermometer, as deduced from this discussion of

the photographic records, have been already communicated to the Meteorological Society.*

ROYAL OBSERVATORY, EDINBURGH. Professor C. Piazzi Smyth, F.R.A.S., Astronomer Royal for Scotland.—The portion of the Budget of the Royal Observatory, Edinburgh, devoted exclusively to Meteorology, is under £150 per annum.

The resulting performance of work consists, as arranged by Government, in the computation of the enormous numbers of instrumental observations made twice a day at 55 stations of the Scottish Meteorological Society; and in furnishing them ready for the press to the Registrar-General of Births, Deaths, &c. in Scotland, every month and every quarter; together with digested comparisons of the chief numerical items of the current time, with the similarly prepared items of the last 19 years; and all such returns have been printed by the said Registrar-General in his Monthly and Quarterly Reports thus far.

Independently of the above obligatory service, the daily notation of the Barometer and several differently-placed Thermometers, together with ordinary weather particulars, for the immediate benefit of the Clock Rate Department of the Royal Observatory, is still kept up; while recent extensive researches in connection with the 'Edinburgh Star Place Catalogue,' now in course of publication, have shown in many new and hitherto unsuspected cases that temperature variation, in its effects both direct and indirect on the mountings of astronomical instruments, is a most fertile, and even terrific, source of occasional error in astronomical results, if not respected, avoided, or eliminated in the completest manner possible.

In Volume XIV. of the 'Edinburgh Astronomical Observations,' just completed at the press, and soon, it is hoped, to be in course of distribution, there are not only many such instances of the advantages in Practical Astronomy of attending particularly to temperature, even in some of its minutest ramifications but there are towards the end of the book 26 pages specially upon the old Edinburgh Earth-Thermometers, and the conclusions, cosmical as well as terrestrial to be drawn from them through the whole of their career from 1837 to 1876.

There are also 21 pages on Spectroscopy, divided into three parts, as thus:—

Part 1 refers to 'Phenomenal Spectroscopy in the small,' from 1870 to 1874. It is illustrated by 13 plates, chromo-lithographed, and is a general winding-up for the now passed away and finished eleven-year-cycle of Sun-spots, of the little that could be done with very imperfect means at command, by the Edinburgh Astronomer, either at home or in several places abroad, in the way of observing the Zodiacal Light, Aurora, Twilight, and Phosphorescence.

Part 2 is termed 'Meteorological Spectroscopy in the small and rough,' between 1872 and 1877; and contains, with two plates, rather a full account of 'Rain-band Spectroscopy,' founded on observations at Edinburgh, Palermo, Toulouse, and Lisbon, all of them taken at the Astronomer's private expense.

Part 3, or 'Solar Spectroscopy in the large,' assisted by three plates, gives the Astronomer's observations during the last summer with a spectroscope of his own, and carried to Lisbon from Edinburgh at his own cost, for supplying the ultra red end of the visible or optical Solar Spectrum, beyond the point where the late M. Angstrom's magnificent map of his Normal Solar Spectrum begins. It is a region where terrestrial meteorological lines are very numerous, and play important parts in certain states of the weather and positions of the Sun, but where there appear to be also some notable solar lines not sufficiently observed hitherto. They were indeed noted with a small apparatus in Plate 55 of Vol. XIII. of the 'Edinburgh Astronomical Observations' in 1872; but a contrary graphical statement having been published by the Royal Society, London, in their 'Philosophical Transactions' in 1875, this further examination appeared to the Astronomer for Scotland to be imperatively called for, and would have been executed sooner if he had been able to procure any funds for the purpose.

KEW OBSERVATORY. George M. Whipple, B.Sc., F.R.A.S., Superintendent.—The several self-recording instruments for the continuous registration respec

* *Vide* 'Quarterly Journal,' Vol. III., pp. 400 and 468.

tively of pressure, temperature, humidity, wind (direction and velocity), and rain at this Observatory have been maintained in regular operation during the past year. The daily standard eye-observations for the control of the automatic records have been made regularly, as well as daily observations in connection with the Washington synchronous system.

The examination and checking of the work of the self-recording Observatories of the Meteorological Committee was discontinued in November 1876, and the scales and appliances used in the work returned to the Meteorological Office. This change of arrangements has involved a considerable reduction in the amount allowed by the Meteorological Office to Kew, as its central Observatory. This sum is now £150, instead of £400, as heretofore.

The cause of derangement of the Electrograph instrument having been apparently removed, by dismounting and thoroughly cleaning it, its action has been fairly satisfactory throughout the year. Considerable difficulty has been experienced at times in maintaining the cistern of the water-dropping collector in a sufficiently insulated condition. The substitution of a set of Varley's telegraph insulators for the ebonite supports previously used has been attended with good results. The tabulation of the curves obtained from this instrument has not yet been commenced. An instrument having been constructed for the Royal Observatory, Greenwich, similar to the one at Kew, certain minor alterations in the details have been introduced which Mr. Whipple's experience has suggested.

The Solar-radiation Thermometers are still observed daily.

The Campbell Sundial continues in action, and the improved form of the instrument, giving a separate record for every day of the duration of sunshine, has been regularly worked throughout the year and its curves tabulated.

The Wind Component Integrator, an instrument which automatically resolves the velocity of the wind into its rectangular components, which was exhibited by Prof. von Oettingen, of Dorpat, at the recent Loan Exhibition, having been lent by the Guarantors of that Exhibition to the Meteorological Council, has been erected in the sun-room of the Observatory at their expense. The instrument has been temporarily attached to the existing anemograph, and its gearing so modified as to enable it to print from type-wheels on a strip of paper the number of miles of wind passing over the building from the North, East, South, and West during every half hour.

At the request of the Editor of the 'Times,' a copy of the traces of the self-recording instruments on a reduced scale, together with an epitome of the general features of the weather, is now prepared. This is published every week in that journal, the cost to the Observatory being defrayed by the proprietors.

The Verification department of the Observatory has been carried on with considerable success as usual.

In addition to those for the Admiralty, the Meteorological Council, and the opticians, a number of instruments of various kinds have been verified for the Standards Department and the Ordnance Department, Woolwich. The total increase in the number of instruments verified over last year has been 680, and in fees earned £25 11s. 2d. Arrangements have been made with Mr. Strachan, of the Meteorological Office, who now receives instruments for verification at Kew, at 116 Victoria Street, Westminster, and takes charge of them on their return.

Mr. Galton's apparatus for testing Thermometers has continued to work satisfactorily; and a paper containing a description of the instrument, with an illustration, has been published in Vol. XXVI. of the 'Proceedings of the Royal Society.'

The new Cathetometer has received some slight additions tending to improve its usefulness.

Experiments have been made with the new Deep-sea Sounding Thermometer, invented by Messrs. Negretti and Zambra; and the Committee have under consideration the construction of an apparatus for the purpose of verifying this class of instrument under varying hydraulic pressure.

A system has also been organised for etching a 'Hall-Mark' upon all Thermometers which have been verified. A pantagraph has been purchased for the purpose of engraving this mark and a register number upon the instruments.

The old 'Royal Society' Standard Barometer, constructed by Newman in 1837, under the direction of Mr. Bailey, which has been in a defective condition

since its removal from the Society's Rooms in Somerset House in 1857, having been lent to the Kew Committee by the Council of the Royal Society for one year, has been thoroughly repaired, both its tubes being refilled, and is now erected at the Observatory, with a view of making a lengthened series of comparisons with the two normal Barometers of the establishment.

The Astronomer Royal having courteously offered the Committee every facility for a suggested comparison between the Greenwich and Kew Standard Barometers during April and May last, a number of carefully-selected Portable Standard Barometers were conveyed to and fro between Greenwich and Kew on three separate occasions, and a large number of comparative readings were obtained by the Superintendent and Messrs. Baker and Foster. A complete detailed account of the experiment has been drawn up, and will be laid before the Royal Society. A determination has been made of the daily range of the Thermometer at Kew for the past twenty-one years, viz. 1855-75, inclusive. The results have been discussed by Prof. Balfour Stewart, and embodied by him in a paper 'On the Variations of the Daily Range of Atmospheric Temperature as recorded at the Kew Observatory,' Proc. Roy. Soc. Vol. XXV. No. 178.

In addition to the usual tables of magnetic results appended to the published annual report of the Kew Committee, Tables of Meteorological Results for the year Oct. 1876 to Sept. 1877, have been given with the one recently issued. These tables show for each month means and extremes of the Thermometer, means and extremes of the Barometer, means of Vapour Tension and dry air pressure, amount of cloud, total and extremes of rainfall, also weather, wind and sunshine amounts.

RADCLIFFE OBSERVATORY, OXFORD. Rev. R. Main, F.R.S., M.A., Radcliffe Observer.—No change of any importance has been made in the arrangements or the observations of the Meteorological Department of this Observatory, but the observations have been carried on with the same success and punctuality as in former years.

The whole volume of the Radcliffe Observations for 1875 is completely printed, and the results, both astronomical and meteorological, will, in a few days, be in the hands of those interested in them.

A similar Appendix to that which accompanied the last volume of Meteorological Results is added to that of 1875, and it gives the mean results for 21 years (including 1875) for the barometer, air temperature and evaporation temperature, and for 25 years in the case of the rainfall.

With regard to the observations communicated to the Meteorological Office, it may be mentioned that the results are now obtained from instruments sent down from the Office precisely similar to those at the other stations, namely, a rain-gauge of the same size and construction as the others, and thermometers enclosed in a cage exactly similar.

It may also be mentioned, that in the volume for 1875 will be found a set of tables giving the mean *yearly* averages and mean *yearly* diurnal inequalities of the barometer, air temperature and evaporation temperature, by means of Bessel's interpolation formula for the years 1862 to 1875. In preceding volumes the mean monthly results only had been given, and it has been thought desirable to complete this important class of investigations relating to climate by adding the yearly results.

CAMBRIDGE OBSERVATORY. Professor J. C. Adams, M.A., F.R.S.—The meteorological work at the Observatory has been carried on by Mr. Todd as in former years, the observations being made at 8 a.m. and 6 p.m. for the Meteorological Office, London, and the synchronous meteorological observations 0h. 45m., Greenwich mean time, for the American Government. During the past year Mr. Todd has been endeavouring to obtain observations of hailstorms passing over a radius of twelve miles from Somersham Railway Station; but yet no very satisfactory observations have been sent him. The Insurance Companies charge an extra premium for hailstorms for that district, and it would be interesting to discover what there is in the country to attract these storms.

STONYHURST OBSERVATORY. Rev. S. J. Perry, S.J., F.R.S.—Besides the observations common to all the meteorological observatories of the Meteorological Office, and the continuous photographic record of the changes of the magnetic declination, and of the two components of the earth's magnetic force, daily meteorological observations continue to be taken at 9 a.m. and 9 p.m., and also weekly readings of the absolute magnetic declination, with monthly determinations of the dip of the needle, and of the horizontal component of the force. The upper clouds are watched for the Upsala Observatory, and results are contributed to the daily synchronous observations for the American Government. The usual yearly and monthly reports are printed for private circulation, and monthly tables of results are forwarded to the Registrar-General, and to the French Meteorological Society. Other data have also been supplied in connection with rainfall, the water supply for neighbouring towns, &c.

The magnetic observations taken at Kerguelen on occasion of the Transit of Venus Expedition, and also those obtained during the voyage, have been reduced, and presented in two papers to the Royal Society. We are at present engaged on the reduction of four months' meteorological observations likewise taken at Kerguelen during the stay of the Transit of Venus Expedition. The astronomers remained in Royal Sound during the summer months of November, December, January and February, and during the whole of that time the barometer, the dry and wet bulb thermometers, the direction and force of the wind, the nature and amount of cloud, and the state of the weather and of the sea were observed every two hours, day and night; and twice a day the maximum and minimum in shade, and a solar radiation thermometer, also a minimum on grass, four earth thermometers and a self-recording anemometer were duly registered. During the day hours the temperature and specific gravity of the sea were added to the other observations.

V. *On the Winter Climate of some English Sea-side Health Resorts.*

By JOHN W. TRIPE, M.D., Secretary.

[Received January 10th.—Read February 20th, 1878.]

As no recent meteorological observations at sea-side places have been brought together, and as even those which have been published are not for corresponding years, I thought that a paper on this subject might be useful not only to the Fellows of the Meteorological Society, but also to many who are desirous of having change of air during the winter months. There is no doubt that many persons go abroad for the benefit of their health who would remain at home if they were acquainted with the numerous suitable localities to be found in this country, and it is partly to supply this want as regards a few well-known health resorts that this paper has been written. It may be said that this Society was not instituted for such a purpose as this, but only for the discussion of scientific matters connected with the science of Meteorology. As, however, I demur to this view, and consider that one great end of all scientific work consists in the spread of useful knowledge amongst the many, I trust I may be pardoned, whilst holding the office of Secretary, in writing a paper which is made up of the tabulation and discussion of other persons' observations. I have also been induced to take this course by the large mass of observations which are being recorded day by day in this country, and are rarely drawn out of the works in which they are published.

It is true that there is great excuse for the non-utilisation of many of

these observations, as, in consequence of the positions in which the instruments have been placed, the variety of screens employed for thermometers, and other causes, the results are scarcely comparable. A notable instance of this has occurred in the rain observations taken for many years in some parts of Devonshire, where the rain gauges were placed on the roofs of houses and connected by pipes with receivers placed in a room beneath. These records were quoted by Dr. Scoresby Jackson in his 'Medical Climatology,' as disproving the generally received opinion as to the comparatively large rainfall in that county, whereas Mr. Vivian, by comparing since 1870 the rainfall on his roof with that on his lawn, has found that the observations made before that date were deficient by about 25 per cent., thus restoring these localities to their original position as regards rainfall. The care with which stations have been examined by Mr. Symons for this Society, and at other stations for his own rainfall publications, will prevent similar errors for the future.

The chief difficulties under which what I may call *comparative meteorology* labours, arise from most of the stations being the property of private persons, and consequently not always placed in the positions best suited for giving a fair mean of the climate of the locality, and from the cessation of observations by the removal or death of the observer, and from what may be called 'private affairs.' Thus I have not been able to obtain reliable returns even for the short period of four years from the places which I deemed most suitable for the object in view, but have had to content myself with observations for three years only at Hastings and Ramsgate; but this is of less consequence, as I have made Camden Town my standard of comparison, and have constructed a four and a three years' table for that locality. It may also be objected that four years is too short a time for the purpose; which I should admit, if I had proposed to do anything more than give a comparison of the results obtained at the various stations.

I propose placing the localities to be treated of, except in some instances in the order of their mean temperature, and shall therefore discuss the mean temperature first. I would here remark that the general opinion of sea-side observers is, that the mean temperature should be obtained by simply adding together the daily maximum and minimum observations and then dividing by 2, without applying any corrections whatever. This opinion is very strongly supported by the comparisons made by the late Mr. W. P. Dymond (see 'Meteorology of West Cornwall') of the means of the maximum and minimum with those of the hourly observations taken at Falmouth in the years 1870-4. From these he shows that the true corrections in the five years were only + 0°·1 for November, —0°·1 for December, + 0°·2 for January, 0°·0 for February and + 0°·1 for March; whilst the means from the maximum and minimum observations with the corrections applied, as calculated by Mr. Glaisher, differed from those derived from the hourly value to the following extent, viz. in November —0°·5, in December + 0°·1, in January —0°·4, in February —0°·4, and in March —1°·1. I have not, however, recalculated the means given by Mr. Glaisher in the Registrar General's Returns, as I considered it

best to take them as printed, at any rate until the matter is settled by further investigations. I would also mention that the Torquay observations are not incorporated with the others, as I did not receive them from Mr. Vivian until after the Paper was written.

TABLE I.—Monthly Mean Temperature.

1873-7.	Nov.	Dec.	Jan.	Feb.	March.	Means.
	°	°	°	°	°	°
Scilly	50·1	47·1	47·8	46·9	47·5	47·9
Penzance	47·6	45·3	45·9	45·0	45·3	45·8
Guernsey	48·4	44·4	45·3	43·4	43·3	45·0
Barnstaple	46·6	43·1	45·0	43·8	44·5	44·6
Ventnor	47·7	42·7	44·8	42·8	44·0	44·4
Llandudno	45·1	42·9	44·1	42·3	43·3	43·5
Means	47·6	44·4	45·5	44·0	44·7	45·2
Camden Town	43·4	39·6	41·5	39·8	42·3	41·3
Torquay	49·0	45·5	46·6	44·2	46·4	46·3
1874-7. Ramsgate	44·1	40·1	41·5	39·8	41·8	41·5
1874-7. Hastings	44·1	39·7	41·6	40·0	40·8	41·2
1874-7. Camden Town	43·0	39·1	41·3	40·1	41·6	41·0

The high monthly means at St. Mary's, Scilly, are very marked even when compared with those of Penzance, from which it is separated by a few miles of sea. Thus in November, when the mean at Penzance was the same as for all the five other localities, viz. Scilly, Guernsey, Barnstaple, Ventnor, and Llandudno, that for Scilly was 2°·5 above it, in December it was 2°·7, in January 2°·8, in February 2°·9, and in March 2°·8 above the mean of the whole six; and it was no less than 6°·7 above that of Camden Town, London, in November; 7°·5 in December; 6°·8 in January; 7°·1 in February, and 5°·2 in March. The mean of these years for the five months at Scilly was 2°·1 above that of Penzance; 2°·9 above Guernsey; 3°·3 above Barnstaple; 3°·5 above Ventnor; 4°·4 above Llandudno; and after allowing for the absence of observations during 1873-4, when the temperature was above the average, it was 6°·1 above that of Ramsgate, and 6°·4 in excess of Hastings. It is true that the means for Hastings and Ramsgate are below what they would be in the sheltered parts of these towns, because the observations are taken at Ramsgate 108 feet, and at Hastings 172 feet above sea level, so that both stations are exposed to the land winds. At Guernsey the station is higher still, viz. 204 feet, but that is not of so much importance, as the island is small, and situated some distance from other land. The mean at Guernsey for the five months was 45°·0, which is 0°·2 below the mean for the six stations, and varied in the different months, as it was + 0°·8 in November; the same in December; — 0°·2 in January; — 0°·6 in February; and — 1°·4 in March. On comparing these means with those of Camden Town, we find a considerable advantage as regards warmth in the first four of these months, but much less in March, as it was + 5°·0 in November; + 4°·8 in December; + 3°·8 in January; + 3°·6 in

February; and only + 1°·0 in March. The mean at Barnstaple was 44°·6, or 3°·3 below that of Scilly, 1°·2 below Penzance, and 0°·4 below Guernsey; but was 0°·2 above Ventnor, 1°·1 above Llandudno, 3°·8 above Camden Town, 2°·8 above Ramsgate, and 3°·1 above Hastings, after allowance had been made for the return being for three years only at these two last-named places. The greatest departure of the Barnstaple mean temperature from the means of these six places occurred in November and December, when it was 1°·0 and 1°·3 below the others. At Ventnor the mean for these years was 0°·8 below that for the six localities; but it was 0°·1 higher in November; 1°·7 below in December; 0°·7 in January; 1°·2 below in February; and 0°·7 in March. On comparing it with Camden Town, we see a very marked difference, considering the short distance between the two places, as the mean was 3°·1 higher at Ventnor for the five months, being + 4°·3 in November; + 3°·1 in December; + 3°·3 in January; + 3°·0 in February; and + 1°·7 in March. Llandudno has a decidedly lower mean temperature than the mean of the six stations, viz. 43°·5 against 45°·2. The defect in each month was as follows: in November, 2°·5; in December, 1°·5; in January, 1°·4; in February, 1°·7; in March, 1°·4; whilst as compared with Camden Town there was an excess for all the months by 2°·2, or 1°·7 for November; 3°·3 for December; 2°·6 for January; 2°·5 for February; and 1°·0 for March. A comparison between the monthly mean temperatures for Ramsgate, Hastings and Camden Town for the three winters 1874-77, shows the two former to have been 1°·1 warmer in November; also that Ramsgate was 1°·0 and Hastings 0°·6 warmer in December; Ramsgate 0°·2, Hastings 0°·3 warmer in January; but both were colder in February to the extent of — 0°·3 at Ramsgate, and — 0°·1 at Hastings; also that in March, Hastings was 0°·8 colder, and Ramgate 0°·2 warmer than Camden Town. It is, therefore, evident that the more exposed parts of Ramsgate and Hastings differ but little as regards mean temperature from that of London, although, as we shall see, the daily and monthly ranges of temperature are less. The mean air temperature for Torquay was singularly high, but there is no doubt it was materally influenced by the protected position of Woodville, where the observations are taken. Thus the mean for the five months in the years 1878-77 was 46°·3, being intermediate between Scilly and Penzance, whilst those for the different months were 49°·0 in November; 45°·5 in December; 46°·6 in January; 44°·2 in February; and 46°·4 in March, the values being in every month above the means of Penzance and every other station mentioned except St. Mary's, Scilly.

The means of all the highest in each month do not precisely follow the same order as that of the mean daily temperature, for although the Scilly Islands still head the list with 50°·5, yet Barnstaple is the second with 49°·7 Guernsey next with 49°·2; Penzance next with 48°·6; while Ventnor and Llandudno follow with 48°·3 against 46°·9 at Camden Town. The mean daily maxima at Ramsgate and Hastings for the three years were 46°·0 and 45°·4 respectively, so that the maximum as well as the mean temperature of Ramsgate is slightly in excess of that of Hastings. This is most marked in

TABLE II.—Temperature. Mean of all the Highest.

1873-77.	Nov.	Dec.	Jan.	Feb.	March.	Means.
	°	°	°	°	°	°
Scilly	52·2	50·1	50·9	49·6	49·6	50·5
Penzance	50·6	47·6	48·6	47·6	48·5	48·6
Guernsey	51·9	48·1	49·3	47·6	48·8	49·2
Barnstaple	51·9	47·3	49·7	48·6	50·8	49·7
Ventnor	52·1	46·1	47·8	46·7	49·0	48·3
Llandudno	49·5	46·5	49·2	47·1	49·3	48·3
Means	51·4	47·9	49·2	47·9	49·3	49·1
Camden Town	48·8	43·8	46·6	45·4	49·8	46·9
Torquay	53·6	50·0	50·7	48·1	51·4	50·8
1874-7. Ramsgate	48·9	43·6	46·1	43·8	47·7	46·0
1874-7. Hastings	48·8	42·9	45·3	44·0	46·2	45·4

December, January and March, whilst Ramsgate is deficient to the extent of 0°·2 in February. The mean of all the highest at Scilly, in November, was 52°·2, or 0°·8 above the mean of the six stations; 50°·1, or + 2°·2 in December; 50°·9, or + 1°·7 in January; 49°·6, or + 1°·7 in February; and 49°·6 again in March, when the excess was only 0°·8. At Penzance, probably owing to the prevalence at times of excessive moisture in the upper air, the mean of the highest is lower than at Guernsey in every month. It is also lower than at Barnstaple in November, January, February, and especially in March, when easterly winds are so prevalent at Penzance, and at Ventnor in November and March. As regards Guernsey, the means are very nearly the same as those of the six stations, being a little above in November, December and January, but a little below in February and March. The mean at Ventnor in November was the highest of all, except at Scilly, having been 52°·1 against 52°·2 at Scilly; 51°·4 at the six stations; and 48°·8 at Camden Town. In December the mean at Ventnor fell to 46°·1, which is 1°·8 below that of the others, but 2°·8 above Camden Town. In the following months, the means were 1°·4, 1°·2 and 0°·8 below those of the six stations; but the mean was 2°·8 above that of Camden Town in December, and 1°·2 and 1°·8 above it in January and February; but 0°·8 below Camden Town in March. The mean of all the highest at Camden Town in March having been 0°·5 above the means of the six sea-side stations was unexpected, especially as the mean daily temperature was so much deficient. The means for the five months in 1873-77 at Torquay was as high as 50°·8, which is 0°·8 above that of Scilly; 1°·7 above the mean of the six warmest stations; and higher than that of Scilly in November and March; slightly below it in December and January; but considerably below it in February. The means were 53°·6, 50°·0, 50°·7, 48°·1 and 51°·4 for the winter months of November to March, inclusive.

The night temperature of a locality is one of the most important meteorological elements for the consideration of invalids, and, therefore, demands rather full discussion. The monthly means of all the lowest at

TABLE III.—Temperature. Mean of all the Lowest.

1873-77.	Nov.	Dec.	Jan.	Feb.	March.	Means.
	°	°	°	°	°	°
Scilly	47·3	44·0	44·6	44·2	42·6	44·5
Penzance	44·4	42·2	43·2	42·3	40·9	42·6
Guernsey	44·4	40·5	41·5	40·2	39·7	41·3
Ventnor	43·4	39·4	40·8	39·0	39·1	40·3
Barnstaple	41·8	38·1	40·3	39·5	39·7	39·9
Llandudno	40·8	38·5	39·0	37·8	38·0	38·8
Means	43·7	40·2	41·6	40·5	40·0	41·2
Camden Town	37·9	34·9	36·0	34·9	35·6	35·9
Torquay	44·3	44·1	42·5	40·4	41·3	41·9
1874-7. Ramsgate	39·1	35·7	35·9	35·5	35·9	36·4
1874-7. Hastings	39·9	36·6	37·9	36·2	35·8	37·3
1874-7. Camden Town	37·6	34·6	36·0	35·4	35·1	35·7

Scilly varied only 4°·7 in the five months, as in November it was 47°·3, and in March 42°·6. The difference at Penzance was less, although the mean March minimum temperature was 1°·7 below that of Scilly, because the November mean was 2°·9 below that of the former, viz. 44°·4, and the March mean 40°·9. At Guernsey the November mean was the same as at Penzance, viz. 44°·4, but the March mean was 39°·7, or — 1°·2; the means for December, January and February being 40°·5, 41°·5 and 40°·2 against 44°·0, 44°·6 and 44°·2 in Scilly; and 42°·2, 43°·2 and 42°·3 in Penzance; so that even at Guernsey the mean night temperature for the five months is 3°·2 below that of Scilly, and 1°·3 of Penzance; but it is above that of Barnstaple by 1°·4; of Ventnor by 1°·0; of Llandudno by 2°·5; of Camden Town 5°·4; and of Ramsgate and Hastings, after allowing for the omitted year 1873-74, by 4°·6 and 4°·0 respectively. The mean night temperatures of December, January and February are moderately uniform at Scilly, Penzance and Guernsey, having varied only 0°·6 at Scilly; 1°·1 at Penzance; and 1°·3 at Guernsey; whilst at Ventnor the variation was 1°·3; at Ramsgate only 0°·4; at Hastings 1°·7; and at Camden Town 1°·4. The mean of all the lowest varied in March as compared with February, to the following extent, viz. at Scilly it was — 1°·6, at Penzance — 1°·4, at Guernsey — 0°·5, at Ventnor + 0°·1, at Barnstaple + 0°·2, at Llandudno + 0°·2, at Torquay + 0°·9, and at Camden Town + 0°·7. As regards Ramsgate and Hastings (for three years only) the difference was rather considerable, as the mean at Ramsgate was + 0°·4, and at Hastings — 0°·4, whilst at Camden Town it was — 0°·3 in March as compared with that for February in these years.

The mean minimum temperatures presented great differences at the sea-side localities in the West of England and Ventnor, as compared with those of Hastings, Ramsgate and Camden Town; thus in November, the means were 47°·3 at Scilly, 44°·4 at Penzance, 41°·8 at Barnstaple, 43°·4 at Ventnor, 43°·7 at the six localities, 37°·9 at Camden Town, 40° (corrected) at Hastings, and 39°·4 at Ramsgate. In December they were

44°·0 at Scilly, 42°·2 at Penzance, 38°·1 at Barnstaple, 39°·4 at Ventnor, 40°·2 at the six places, 34°·9 at Camden Town, 36°·0 at Ramsgate, and 36°·9 at Hastings (both corrected). In January the means were 44°·6 at Scilly, 43°·2 at Penzance, 40°·3 at Barnstaple, 40°·8 at Ventnor, 41°·6 at the six stations, 36°·0 at Camden Town, 36°·2 at Ramsgate, and 38°·2 at Hastings. In February the means were 44°·2 at Scilly, 42°·3 at Penzance, 39°·5 at Barnstaple, 39°·0 at Ventnor, 40°·5 at the six stations, 34°·9 at Camden Town, 35°·8 at Ramsgate, 36°·5 at Hastings, and 40°·4 at Torquay. In March they were 42°·6 at St. Mary's, 40°·9 at Penzance, 39°·7 at Barnstaple, 39°·1 at Ventnor, 40°·0 at the six stations, 35°·6 at Camden Town, 36°·2 at Ramsgate, 36°·1 at Hastings, and 41°·3 at Torquay. The great superiority of Scilly, Penzance, Ventnor, Guernsey, and Torquay over the other stations is evident, except that at Ventnor the night temperatures are lower than at Barnstaple in February and March. This *resumé* also shows the close agreement between the mean minimum temperatures at Camden Town, Ramsgate, and Hastings, whilst the table also indicates that Llandudno occupies in this respect a position midway between Barnstaple, Hastings, and Ramsgate, the night temperature being higher than at Ramsgate and Hastings, but lower than that at Barnstaple. The mean daily minima temperatures at Torquay are singularly high, having been 0°·7 above the mean for the six warmest stations during the period under discussion, and higher than any except Scilly and Penzance. There was, however, a considerable difference between that of Scilly and Torquay, as the mean of the former station was 44°·5 against 41°·9 for Torquay; 47°·8 in November against 44°·8; 44°·6 in January against 42°·5, and as much as 44°·2 in February against 40°·4 at Torquay. As regards Penzance, except in February, when Penzance had the highest night temperatures, the differences are comparatively small.

TABLE IV.—Temperature. Mean Daily Range.

1873-77.	Nov.	Dec.	Jan.	Feb.	March.	Means.
	°	°	°	°	°	°
Scilly	4·9	6·1	6·3	5·4	7·1	6·0
Penzance	6·2	5·2	5·4	5·3	7·6	6·0
Guernsey	7·4	7·6	7·8	7·5	9·1	7·9
Ventnor	8·7	6·7	7·0	7·7	9·9	8·0
Llandudno	8·6	8·0	10·1	9·2	11·3	9·5
Barnstaple	10·1	9·1	9·4	9·0	11·1	9·8
Means	7·7	7·1	7·7	7·4	9·4	7·9
Camden Town	10·9	8·9	10·6	10·5	14·2	11·0
Torquay	9·3	9·0	8·2	7·6	10·1	8·8
1874-7. Hastings	8·9	6·3	7·4	7·8	10·4	8·1
1874-7. Ramsgate	9·8	7·9	10·2	8·3	11·8	9·6

The mean daily range of the six stations in the months November to

March inclusive, was 7°·7, 7°·1, 7°·7, 7°·4, and 9°·4, and for Camden Town 10°·9, 8°·9, 10°·6, 10°·5, and 14°·2; those for Hastings and Ramsgate being intermediate, Hastings having the least of the two. The mean for Scilly and Penzance was 6°·0, for Guernsey 7°·9, for Ventnor 8°·0, Llandudno 9°·5, and Barnstaple 9°·8, giving an average of 7°·9, against 11°·0 for Camden Town, 8°·1 for Hastings, and 9°·6 for Ramsgate. At Scilly, the smallest mean daily range, 4°·9, occurred in November, the next in February, viz. 5°·4, and the largest in March, viz. 7°·1. At Penzance, the smallest range occurred in December and February, viz. 5°·2 and 5°·3, and the largest in March, viz. 7°·6. At Guernsey, the range exceeded 7°·0 in every month, having been 9°·1 in March; at Ventnor it oscillated between 6°·7 in December, 7°·0 in January, and 9°·9 in March; at Llandudno between 8°·0 in December, 8°·6 in November, and 11°·8 in March; at Barnstaple the range was greater, the smallest having occurred in February, viz. 9°·0, the next in December, 9°·1, and the greatest in March, 11°·1. The range at Hastings was as small as 6°·8 in December, 7°·4 in January, and reached 10°·4 in March, whilst at Ramsgate it was greater, viz. 7°·9 in December, 8°·8 in February, and 11°·8 in March. As might have been expected, the monthly variations at Camden Town were larger than at any of the other stations, viz. 8°·9 in December, 10°·6 in January, and 14°·2 in March. The daily range at Scilly and Penzance is singularly small, less indeed than at most of the foreign health resorts. Thus at Madeira, for the four years (1848-51), the mean daily range for these months was 6°·8, 5°·6, 7°·1, 5°·7 and 5°·7, giving an average of 6°·1, or 0°·1 greater than at Scilly and Penzance. The daily range at Torquay, chiefly owing to the higher day temperature, was larger than that observed at the six warmest stations, considerably above that of Scilly, Penzance, and somewhat greater than at Guernsey, Ventnor, and even Hastings. The mean for the five months in the years 1873-77 was 8°·8, having been 9°·3 in November, 9°·0 in December, 8°·2 in January, 7°·6 in February, and 10°·1 in March.

TABLE V.—Temperature. Monthly Range.

1873-77.	Nov.	Dec.	Jan.	Feb.	March.	Means.
	°	°	°	°	°	°
Scilly	18·5	18·5	18·2	18·0	20·5	18·7
Penzance	23·2	21·7	18·1	21·0	22·4	21·3
Guernsey	23·7	24·2	22·2	22·1	25·8	23·6
Ventnor	28·7	25·2	21·5	23·0	27·7	25·2
Llandudno	29·3	27·0	28·5	28·5	28·1	28·3
Barnstaple	31·8	29·8	28·1	25·0	30·3	29·0
Means	25·9	24·4	22·8	22·9	25·8	24·4
Camden Town	32·1	32·2	31·1	31·7	37·2	32·9
Torquay	27·2	26·2	23·0	24·7	25·4	25·3
1874-77. Hastings	29·4	26·8	26·9	26·3	29·5	27·8
1874-77. Ramsgate	32·3	32·3	32·6	30·7	28·9	31·4
Falmouth 1870-74	20·6	19·5	17·9	17·1	24·1	19·8

The monthly range of temperature at Scilly was, as might have been expected, very small when compared with that of London, Ramsgate, and even Barnstaple, having been only 18°·7 for the five months, against 32°·9 at Camden Town and 29°·0 at Barnstaple. As the range at Falmouth is almost as small, I have added the observations at that station for the years 1870-4, which gives a mean monthly range of only 19°·8, that at Penzance being 21°·3, at Guernsey 23°·6, at Ventnor 25°·2, at Llandudno 28°·3, and at Hastings 27°·8. The monthly range at Scilly scarcely varied at all during the five months, as it was 18°·5 in November, 18°·5 in December, 18° 2 in January, 18°·0 in February, but increased to 20°·5 in March. The variations at Falmouth were greater, as the range was 20°·6 in November, 19°·5 in December, 17°·9 in January, 17°·1 in February, and 24°·1 in March, in consequence of its exposure to the easterly winds. At Penzance the range exceeded that of Falmouth for every month except March, and for that of Scilly except in February, when it was 0°·1 less, the means for these months being respectively 23°·2, 21°·7, 18°·1, 21°·0 and 22°·4. At Guernsey the figures were 23°·7, 24°·2, 22°·2, 22°·1, and 25°·8, so that the mean for all the months was 4°·9 greater than at Scilly, the largest variations occurring in November, December, and March. At Ventnor, the means were respectively 28°·7, 25°·2, 21°·5, 23°·0, and 27°·7 in March, being more than 10°·0 greater in November than at Scilly, 6°·7 in December, only 3°·3 in January, 5°·0 in February, and 7°·2 in March. At Llandudno the range in these months was 29°·3, 27°·0, 28°·5, 28°·5, and 28°·1. At Barnstaple it was greater in November but less in February, being only 25°. At Camden Town the mean of the monthly ranges was 32°·1 in November, 32°·2 in December, 31°·1 in January, 31°·7 in February, and 37°·2 in March, showing but a slight variation in the extent of range in all the months except March. At Hastings the range was less than at Llandudno, and also at Camden Town, as in November it was 2°·7 smaller, in December 5°·4, in January 4°·2, in February 5°·4, and in March as much as 7°·7 less, whilst at Ramsgate the range was nearly as great as in London, except in March, when it was as much as 8°·3 smaller, being below that of Barnstaple. The same causes that produced the increased daily range are more visible at Torquay as regards the monthly range, so that the mean was 25°·3 against 18°·7 at Scilly, 21°·3 at Penzance, 23°·6 at Guernsey, and 25°·2 at Ventnor. The excess was greatest in November and December.

The climate of a given locality depends materially on its aspect, that is to say, on the extent to which it is exposed to or sheltered from certain winds. Thus the Undercliff, Isle of Wight, enjoys a singularly pleasant winter climate in consequence of the protection afforded by the cliffs which shelter it from the land winds, so that the only winds which reach it are tempered by the extent of sea over which they pass before reaching the land. Penzance again, in consequence of its comparatively unprotected position, suffers from the easterly winds which, in March, prove injurious to delicate persons residing there. The table, which for this part of the discussion is very limited, shows that north-easterly winds prevailed during these months

TABLE VI.—Wind. Relative Proportion of N and E.

1873-77.	Nov.	Dec.	Jan.	Feb.	March.	Totals.
Scilly	14	11	7	10	14	56
Penzance	14	12	6	11	14	57
Guernsey	14	13	10	12	14	63
Barnstaple	12	12	9	10	11	54
Llandudno	12	8	5	9	10	44
Means	13·2	11·2	7·4	10·4	12·6	55
Camden Town	16	11	8	12	11	58
1874-77. Ramsgate	14	13	10	11	14	62
1874-77. Hastings	14	14	9	12	14	63

to a greater extent at Scilly, Penzance, and Guernsey, as well as at Hastings and Ramsgate, than at Camden Town, and that they were also more prevalent these stations in November than during the other months, with the exception of Hastings. At all the stations these winds occurred in January less often than in any of the other winter months, and February came next to January. The total number of days, out of 151 in the five months in which northerly or easterly winds prevailed, was 55, against 95 in which they were either southerly or westerly. At Scilly, northerly or easterly winds occurred on 56 days, Penzance on 57 days, at Guernsey on 63 days, being especially frequent January and February; at Barnstaple on 54 days, at Llandudno on 44 days only, at Camden Town on 58 days, at Ramsgate on 62, and at Hastings on 63 days.

TABLE VII.—Wind. Relative Proportion of S and W.

1873-77.	Nov.	Dec.	Jan.	Feb.	March.	Totals.
Scilly	15	19	23	18	15	90
Penzance	16	19	25	17	17	94
Guernsey	16	18	21	16	17	88
Barnstaple	16	19	22	18	20	95
Llandudno	18	23	26	19	21	107
Means	16	20	23	18	18	95
Camden Town	14	20	23	16	20	93
1874-77. Ramsgate	16	18	21	17	17	89
1874-77. Hastings	16	17	22	16	16	87

The southerly and westerly winds prevailed to a greater extent at some of the sea-side places than at Camden Town, viz. at Penzance, when they were nearly the same at Barnstaple and Llandudno, whilst at Scilly, Guernsey, Ramsgate, and Hastings, they were less frequent. At Scilly, Penzance, Guernsey, and Llandudno, they obtained the highest number in December and January

ıd the lowest either in November or March. At Barnstaple, the largest ımber recorded was in January, and the next in March. At Camden Town, amsgate, and Hastings, they were noted most frequently in January, and least equently in November. The means for these months at Scilly were 15, 19, 9, 18, and 15; at Penzance 16 in November, and in the following months 9, 25, 17 and 17; at Guernsey 16, 18, 21, 16, and 17; at Barnstaple the ımbers were: 16, 19, 22, 18 and 20; and at Llandudno they were larger, z. 18 in November, 23 in December, 26 in January, 19 in February, and 1 in March. The totals were, 90 at Scilly, 94 at Penzance, 88 at Guernsey, 5 at Barnstaple, 107 at Llandudno, 98 at Camden Town, 89 at Ramsgate, ıd 87 at Hastings.

TABLE VIII.—Average No. of Rainy Days in each Month.

1873-77.	Nov.	Dec.	Jan.	Feb.	March.	Totals.
Scilly	21	23	22	22	19	107
Guernsey	19	20	20	18	16	93
Barnstaple	19	20	22	15	16	92
Llandudno	19	14	16	18	16	83
Ventnor	17	16	19	16	12	83
Means	19	19	20	18	16	92
Camden Town	16	15	19	17	16	83
Hastings	16	19	19	18	18	90
Ramsgate	13	16	17	17	14	77
Torquay	19	19	24	19	17	98

Although 0·01in. rainfall is now generally entered in a register as a rainy ay, there doubtless remains some difference in this respect; but still the ımbers above given certainly point to a uniform plan, or nearly so, having en adopted at these stations. Taking the average at Scilly, Guernsey, rnstaple, Llandudno and Ventnor, there were 19 rainy days in November; in December; 20 in January; 18 in February; and 16 in March; whilst Camden Town the numbers were: 16, 15, 19, 17 and 16, or less in each nth excepting March, when they were equal. As regards Hastings and msgate, we find Hastings to have been in excess in each month, as there re 90 rainy days there against 77 at Ramsgate. The largest number of ay days during the five months was registered at Scilly, viz. 107; against at Guernsey, 92 at Barnstaple, 88 at Llandudno, and 83 at Ventnor. e highest number at Scilly was recorded in December; at Guernsey in cember and January; at Barnstaple in January; at Llandudno in rember; at Torquay and Ventnor in January; at Camden Town in nary; at Hastings in December and January; and at Ramsgate in nary and February. I have no return from Penzance as to the number ainy days. This large number of rainy days in winter at our sea-side and er places in England affords a great contrast to the climate of Cannes, leira and Egypt, where rain comparativcly rarely falls in these months, a

circumstance which renders them in some respects much more suitable for invalids.

The number of rainy days at Torquay was in excess of those at all the other stations except Scilly, having been 98 against 107 at Scilly; 93 at Penzance; 92 at Barnstaple; 88 at Llandudno; 88 at Ventnor; 88 at Camden Town; 90 at Hastings, and 77 at Ramsgate. The means for November and December were the same as for these months at the five warmest stations, and above the average for the other months, except January.

TABLE IX.—Monthly Rainfall.

1873-77.	Nov.	Dec.	Jan.	Feb.	March.	Totals.
	In.	In.	In.	In.	In.	In.
Penzance	5·04	6·14	5·97	3·53	2·84	23·52
Guernsey	5·52	5·84	3·96	2·74	2·34	20·40
Barnstaple	3·97	4·37	4·89	2·54	2·68	18·45
Scilly	4·12	4·98	3·92	2·13	1·98	17·13
Llandudno	4·24	2·86	4·04	2·69	2·13	15·96
Ventnor	3·89	3·01	3·84	2·41	1·87	15·02
Means	4·46	4·53	4·44	2·67	2·31	18·41
Camden Town	2·63	2·31	2·11	1·43	1·60	10·08
Torquay	4·48	4·31	4·37	2·99	2·13	18·28
1874-77. Hastings	3·90	3·60	4·08	2·24	2·06	15·88
1874-77. Ramsgate	3·82	3·12	3·12	2·19	2·11	14·36

The mean rainfall at Penzance, Guernsey, Barnstaple, Scilly, Llandudno, and Ventnor was 4·46 in. in November, 4·53 in. in December, 4·44 in. in January, 2·67 in. in February, and 2·31 in. in March, making a total for five months of 18·41 in. against 10·08 in. at Camden Town. The largest rainfall occurred at Penzance, viz. 23·52 in., of which 5·04 in. were registered in November against 5·52 in. at Guernsey, 4·12 in. at Scilly, 3·89 in. at Ventnor, and only 2·63 in. at Camden Town. In December there were 6·14 in. registered at Penzance, 5·84 in. at Guernsey, 4·98 in. at Scilly, 3·01 in. at Ventnor, 2·86 in. at Llandudno, and 2·31 in. at Camden Town. The rainfall at Penzance, Guernsey, Scilly, and Camden Town was less in January than in December, but it was greater at Barnstaple, Ventnor, Llandudno, and Hastings. In February the amount registered was less than in either of the former months at all the stations, having been 3·53 in. at Penzance against 5·97 in. in January; at Guernsey, 2·74 in. against 3·96 in.; at Barnstaple, 2·54 in. against 4·89 in.; at Scilly, 2·13 in. against 3·92 in.; at Llandudno, 2·69 in. against 4·04 in.; at Ventnor, 2·41 in. against 3·84 in.; at Camden Town, only 1·43 in. against 2·11 in.; at Hastings, 2·24 in. against 4·08 in.; and at Ramsgate 2·19 in. against 3·12 in. In March the rainfall decreased still further, so that, except at Barnstaple and Camden Town, the amount was less than in February, the mean at the six first-named stations having been 2·31 in. against 2·67 in. in February, but it was 1·60 in. at Camden

Town against 1·48 in. in February. The amounts at Hastings and Ramsgate varied but little, as at the former station it was 2·06 in. against 2·24 in., and at the latter 2·11 in. against 2·19 in. The amount registered at Penzance was 23·52 in. in the five months, at Guernsey 20·40 in., at Barnstaple 18·45 in., at Scilly 17·13 in., at Llandudno 15·96 in., at Ventnor 15·02 in., at Camden Town 10·08 in., and during the three years 1874-7 at Hastings 15·88 in., and Ramsgate 14·86 in.

The rainfall observations at Torquay are worthy of special notice, as two sets of rain gauges were kept; for the purpose of determining the corrections for the early observations, one of the gauges was placed on the roof of Mr. Vivian's house, and the other on the grass-plot four inches above the level of the ground. The results were as follows:—In the gauge on the roof, 30 feet above the ground, a total of 57·50 in. was collected in the months of November to March inclusive, in the four years 1873-7; whilst there were 73·17 in. collected in the gauge placed on the lawn, so that the early observations at Woodville have to be corrected in this ratio. The excess was noticed on the grass in every month with fair regularity, as the following figures show:—

MEAN RAINFALL AT WOODVILLE, TORQUAY.

1873-7.	Nov.	Dec.	Jan.	Feb.	March.	Totals.
	In.	In.	In.	In.	In.	In.
On lawn 4 in. above ground	4·48	4·31	4·37	2·99	2·13	18·28
30 ft. above ground	3·82	3·22	3·31	2·30	1·72	14·37

The mean rainfall at Torquay, even in the lower gauge, was not so great as at Penzance, Guernsey, or Barnstaple, having been 18·28 in. against 23·52 in., 20·40 in. and 18·45 in. respectively at these stations, but it was larger than at Scilly, Ventnor, Llandudno, Hastings, Ramsgate, and Camden Town. The greatest rainfall, 4·48 in., occurred in November, and the smallest in March, viz. 2·13 in.

TABLE X.

Mean Humidity. Sea-side Stations.

1873-77.	Nov.	Dec.	Jan.	Feb.	March.	Means.
Scilly	88	89	94	90	86	89
Valentia	84	84	86	85	81	84
Falmouth	83	84	88	85	82	85
Barnstaple	85	85	90	87	82	86
Guernsey	86	86	90	88	86	87
Ramsgate	85	83	88	88	82	85
Llandudno	82	83	82	83	81	82
Aberdeen	84	84	84	83	80	83
Means	85	85	88	86	82	85
Cannes 9 a.m.	68·9	68·9	69·9	71·0	71·8	70·1

TABLE XI.

Mean Humidity. Inland Stations.

1873-77.	Nov.	Dec.	Jan.	Feb.	March.	Means.
Norwich	92	95	96	96	93	94
Salisbury	91	90	91	89	87	90
Nottingham	88	91	90	90	84	89
Carlisle	89	91	90	87	86	89
Camden Town	88	89	90	89	83	88
Strathfield Turgiss	86	90	87	88	85	87
Armagh	88	89	89	86	85	87
Eccles	86	88	88	86	84	86
Stonyhurst	85	86	88	86	82	85
Kew	85	89	87	84	79	85
Means	88	90	89	88	85	88

A comparison between the mean Humidity at the sea-side stations and Camden Town having shown that the air at those localities was less saturated with moisture than in London, I decided on extending the list of the sea-side and inland stations, especially as I had not obtained returns of mean humidity from Penzance or Ventnor. I therefore applied to our esteemed Foreign Secretary, Mr. Scott, for some additional data, when he kindly furnished me with the means of the hourly readings of the dry and wet bulb thermometers at Valentia, Armagh, Aberdeen, Falmouth, Stonyhurst, and Kew, and I incorporated with them the returns printed in the Registrar General's Reports for Norwich, Nottingham, Salisbury, Carlisle, Strathfield Turgiss, and Eccles, making altogether eight sea-side and ten inland stations. The figures thus obtained confirm the conclusions I had previously arrived at, as the mean for the sea-side stations was 85, and for the inland 88, saturation being 100. A comparison between the results for each month bears out those obtained for the whole period, as in November the humidity of the sea-side stations was 85 against 88 for the inland; in December 85 against 90; in January 88 against 89; in February 86 against 88; and in March 82 against 85; so that in no instance was the monthly mean of these sea-side localities above that at the inland stations. The mean humidity at each of the sea-side stations for these years was as follows:—at Scilly 89, at Guernsey 87, at Barnstaple 86, at Falmouth and Ramsgate 85, at Valentia 84, at Aberdeen 83, and at Llandudno 82. At the inland stations the values were, Norwich 94, Salisbury 90, Nottingham 89, Carlisle 89, Camden Town 88, Strathfield Turgiss and Armagh 87, Eccles 86, Stonyhurst 85, and Kew 85, whilst at Cannes at 9 a.m. it was only 70. As the mean temperature of the sea-side stations was higher than that of the inland stations, it is probable that the weight of vapour in a cubic foot of air would be about the same at both places, but it is somewhat singular that the air over the sea and at these sea-side places should be drier in winter than that over grass land, unless it be that winds coming from the sea become reduced in temperature, and the amount of saturation consequently rises.

Having determined this point so far, I deemed it advisable to carry the investigation somewhat further, and therefore applied to Mr. Scott for some observations on board ship, which had been taken in the vicinity of the English coast during the month of November for the years 1873-6, so as to compare fairly with the records at the sea-side stations. Mr. Scott most kindly-favoured me with extracts from ships' logs of the observations taken near the entrance of the Channel, between latitude 51°0′ N and 48°0′ N, and longitude 9°40′ W, and 1°40′ W, which I embodied in the following table:—

TABLE XII.—Observations taken on board Ship, between Lat. 51° 0′ N and 48° 0′ N; and Long. 9° 40′ W, and 1° 40′ W.

Nov.	Thermometers.		Sea Temperature.	Mean Humidity.	No. of Observations.
	Dry.	Wet.			
	°	°	°		
1873	52·9	50·9	54·1	87	11
1874	54·3	51·5	55·6	82	9
1875	52·6	51·1	55·4	89	9
1876	54·4	52·5	56·2	87	6
Means ..	53·5	51·5	55·3	86	9

Although this table has been inserted chiefly for the hygrometrical observations, yet I cannot avoid noticing the high mean temperature, viz. 53°·5, against 50°·1 at Scilly in the same month, which I should have scarcely expected. The mean sea temperature was only 1°·8 above the mean air temperature, the range of the former being 1°·6, and of the latter, the air temperature, 1°·8. The mean humidity was 86 against 88 for Scilly, 84 for Valentia, 88 for Falmouth, and 86 for Guernsey, so that the difference is not large, whilst for Norwich it was 92, Salisbury 91, Carlisle 89, Camden Town 88, and for all the inland stations 88, showing that the mean humidity of the air at sea was about the same as at these sea-side stations, whilst it was less than at the inland stations. What is the precise value of the results afforded by a comparison between the temperature of the dry and wet bulb thermometers, especially in winter, I do not propose discussing, suffice it to say that as they are obtained in a similar manner, and are used here only for comparison with one another, they may be considered fairly approximative. I may, however, mention that the values obtained by the reduction of hourly readings at Falmouth, Valentia, Aberdeen, Armagh, Stonyhurst and Kew, are probably lower by 1·5 than those recorded for other stations, which are taken in the ordinary way; but as there are three of the sea-side and the same number of inland stations, the comparative values remain unchanged. I may just mention that during the other months of the year, viz. from April to November inclusive, the mean humidity of the air was higher at these sea-side than at the inland places.

I now propose bringing together the means of the various stations, so as to present at a glance the characteristics of each station, and their relations as regards climate to that of London.

The mean daily temperature of these nine stations in the five winter months 1873-7 was 44°·5 against 41°·3 at Camden Town, showing a mean temperature of + 3°·2 above that of London. The highest mean was recorded at Scilly, viz. 47°·9; the next at Torquay, 46°·3; at Penzance, 45°·8; at Guernsey, 45°·0; at Barnstaple, 44°·6; at Ventnor, 44°·4; at Llandudno, 43°·5; at Ramsgate, 41°·5; at Hastings, 41°·2, and Camden Town, 41°·3. It is,

TABLE XIII.—Mean of the Observations made at each Station.

Dec. to March, 1873 to 1877.	Temperature.					Mean Humidity.	Wind.		Rain.	
	Mean.	Mean Max.	Mean Min.	Mean Daily Range.	Mean Monthly Range.		N and E.	S and W.	No. of Rainy Days.	Amount.
	°	°	°	°	°					In.
Scilly.....	47·9	50·5	44·5	6·0	18·7	89	56	90	107	17·13
Torquay	46·3	50·8	41·9	8·8	25·3	..	..	..	98	18·28
Penzance	45·8	48·6	42·6	6·0	21·3	..	57	94	..	23·52
Guernsey	45·0	49·2	41·3	7·9	23·6	87	63	88	93	20·40
Barnstaple	44·6	49·7	39·9	9·8	29·0	86	54	95	92	18·45
Ventnor	44·4	48·3	40·3	8·0	25·2	..	..		83	15·02
Llandudno	43·5	48·3	38·8	9·5	28·3	82	44	107	83	15·96
1874-77. Ramsgate...	41·5	46·0	36·4	9·6	31·4	86	62	89	77	14·36
1874-77. Hastings	41·2	45·4	37·3	8·1	27·8	..	63	87	90	15·88
Means	44·5	48·5	40·3	8·2	25·7	86	57	93	90	17·63
Camden Town..	41·3	46·9	35·9	11·0	32·9	88	58	93	83	10·08

however, probable from the three years' mean for Camden Town that Hastings and Ramsgate would have shown 0°·8 above the figures just given if observations could have been obtained there for 1873-4. The mean of the daily maxima readings was 48°·5 at the nine stations, and 46°·9 at Camden Town, showing an excess of only 1°·6; but they were higher at Scilly, Torquay, Barnstaple and Guernsey than at the other stations. The mean of the maxima readings was much higher at the nine stations than at Camden Town, having been 40°·8 against 35°·9; the mean highest night temperature having been recorded at Scilly, viz. 44°·5; the next at Penzance, 42°·6; then at Torquay, 41°·9; at Guernsey, 41°·8; and at Ventnor, 40°·8; all the others having a mean night temperature below 40°·0; Barnstaple being the highest of this group with 39°·9. The mean daily range at Scilly and Penzance was only 6°·0 against 7°·9 at Guernsey, 8°·0 at Ventnor, 8°·1 at Hastings, 8°·8 at Torquay, and more than 9°·0 at the other stations. The mean monthly range at Scilly and Penzance was also much smaller than the average of the nine stations, having been 18°·7 and 21°·3 against 25°·7 for the whole, and 32°·9 for London. The mean humidity for Scilly, Guernsey, Barnstaple, Llandudno and Ramsgate was 86 against 88 for Camden Town; Llandudno being much the driest. The general direction of the wind was almost the same at the seven stations and at Camden Town, having been 57 days N and E at the seven stations, and 58 at Camden Town, whilst it was 93 days S and W at the seven stations and Camden Town. The number of rainy days was in excess, viz. 90 at the sea-side, against 83 at Camden Town, whilst the mean rainfall was 17·63in., against 10·08in. in London.

The results of our discussion may be briefly summed up as follows, viz.:—The

mean daily winter temperature of these sea-side places, and especially of those situated on the coasts of Devon and Cornwall, is higher than in London; that the mean daily maximum and minimum are also higher, and especially the latter; so that the daily and monthly ranges of temperature are smaller; that the mean humidity is less; the general direction of the wind about the same, but the number of rainy days and the rainfall are greater at the sea-side. As regards the wind, therefore, the chief point to be especially noted is the amount of shelter afforded by high land as at Ventnor, and especially of protection against the stormy and cold winds which ordinarily prevail at the end of February and in March. The soil also should be considered, as heavy rains at gravelly and chalky places are not so objectionable as on clayey ground. The intimate relations existing between the temperature of the sea and that of sea-side places, especially at night, induces me to give sea temperatures at several stations, but unfortunately these are for different years. They were taken from Whitley's and Dymond's 'Sea Temperatures,' Marcet's 'Climate of Cannes,' and from extracts furnished to me by Mr. Scott from the logs of several ships. I may also mention here that at the Seven Stones Light Ship, near Scilly, it was found that the surface temperature of the sea in December was about 0°·4 below that of the water at 2½ fathoms.

TABLE XIV.—Mean Temperature of the Sea (surface) Nov. to March.

Years.	Localities.	Nov.	Dec.	Jan.	Feb.	March.	Means.
		°	°	°	°	°	°
1856-7	Scilly	51·2	49·0	47·3	49·0	50·2	49·5
1859-60	Seven Stones Light Ship	53·5	52·1	51·2	49·7	49·0	51·1
1852	St. Agnes, Cornwall	53·8	51·9	48·5	48·0	46·9	49·8
1851	Falmouth	52·0	48·0	50·0	48·0	48·0	49·2
1872-4	Ditto (Mr. Dymond)	52·8	50·1	49·2	47·7	48·5	49·7
	Means	52·7	50·2	49·2	48·5	48·5	49·8
1873-6	Off the Coast, Ships' Logs	55·2	..	..	..	..	..
1866	Great Yarmouth	46·9	41·2	37·1	39·2	40·6	41·0
1853-4	Scarborough	48·0	43·5	40·5	41·2	42·8	43·2
1874-7	Cannes	61·3	57·4	56·2	55·1	56·0	57·2

The mean surface temperature of the sea off Scilly was 49°·5 in 1856-7 during the months of November to March inclusive, the highest monthly means having been 51°·2 in November, and the lowest 47°·3 in January, giving a range of 3°·9 only. In 1859-60 the mean off the Seven Stones light ship was 51°·1, the highest, that for November, being 53°·5, and the lowest 49°·0 in March, or a range of 4°·5. The mean off St. Agnes, Cornwall, in 1852, was 49°·8, the highest having been 53°·8, the lowest 46°·9 in March, giving a range of 6°·9; whilst at Falmouth in 1851, the mean was 49°·2, the highest 52°·0, and the lowest 48°·0, so that the range was only 4°·0. The observations made at Falmouth in 1872, 1873, and 1874, were taken a short distance from the shore, and give a mean of 49°·7, the highest temperature being that for the month of November, when it was

52°·8, and the lowest for February, viz. 47°·7, so that the range of the monthly values was 5°·1 against 4°·0 in 1851. At Yarmouth, in 1856, the mean was only 41°·0, that for November being 46°·9, and for January only 37°·1 against 39°·2 in February and 40°·6 in March; whilst at Scarborough in 1853-4, the mean for these months was 43°·2, for November 48°·0, and for January 40°·5, against 41°·2 in February, and 42°·8 in March. The range at Yarmouth was as much as 7°·5, and at Scarborough 6°·8, or greater than the mean air temperature range at Scilly. The sea temperatures at Cannes are so much higher than any observed off this coast that I have calculated the monthly means for 1874-7 from Dr. Marcet's paper, viz. 57°·2 for the mean of the five months, against 51°·1 at the Seven Stones Lightship, and 49°·8 at St. Agnes, Cornwall. The mean for November was 61°·3, and for February, the coldest month, 55°·1, giving a range of 6°·2.

I would also mention that amongst the observations supplied to me by Mr. Scott, were several taken off Aldborough, Lowestoft, Southwold and the Dudgeon, which gave an average of 47°·0 in the month of November, 1878, against that of 54°·1 in the vicinity of the Scilly Isles, and 56° in latitude 44°9′ N and longitude 11°·10′ W., which will partly account for the low winter temperature of Yarmouth and other places on that coast as compared with that of the sea-side places we have just considered.

In conclusion, I have to thank the gentlemen who have assisted by supplying me with copies of the records taken at their stations, and therefore mention Mr. Richards, who sent me his returns for Penzance, Mr. E. Vivian for those of Torquay, Mr. Alexander Murray, F.M.S., for observations taken at Hastings, and Mr. Martin for those taken at Ventnor. I have also to repeat my thanks to Mr. Scott for the large amount of information supplied by him.*

DISCUSSION.

The PRESIDENT (Mr. Greaves) said that the paper was one essentially based on comparisons, and the deductions would consequently be entirely dependent on the accuracy of the local registers. He did not remember any such minute comparisons having been previously made, but the conclusions were in many ways diverse from the ordinary belief, which would probably not readily admit that in any part of the year the west-coast stations were less humid than those inland or on the east coast. He was glad to welcome this study of Medical Climatology, as the subject not only interested a large class of afflicted patients, but a considerable number of eminent physicians.

Mr. SYMONS believed that the differences in the figures were due to the mode of observing and also to the exposure. Some of the observations were made in a Stevenson's stand, and some in a Glaisher's, while at Ventnor the thermometers were placed in a thatched summer-house, and at Penzance the observations were made from a Six's thermometer tied to the door-post. It was, however, peculiar that the observations from the last mentioned place gave results which one might

* Mr. Ellis, of the Greenwich Observatory, informed me after the meeting, that the mean humidity, as printed in the Registrar General's returns, is not the uncorrected mean of the 9 a.m. observations, but the figures have all been corrected to allow for the greater dryness of the air in the middle of the day. This fact has a somewhat important bearing on the discussion.

imagine to fairly represent the climate of the place. All door-posts, however, are not so accommodating.

Mr. DINES said that it was difficult to discuss this paper without a careful reading. He was rather surprised to find the sea-side drier than the inland places, but supposed it would be the reverse in the summer months.

Medical men had ascertained by long experience the places best suited for their patients, but in making inquiries, he had found a difficulty as to what sort of climate was required. Was it a warm and rather humid one, or warm and dry? They were no doubt all agreed that the daily range of temperature should not be too great. From the different returns he had compared, Guernsey seemed to have an even climate, with small daily range and a moderate degree of dryness; there appeared to be a great similarity between Bournemouth and Hastings. Salisbury had the widest daily range, and in the last quarterly returns he had received Camden Town figured as the driest of all the stations.

The question was this, knowing that such places as Bournemouth and Hastings suited consumptive patients, could they by any series of observations find out what other places had the same meteorological conditions?

In a paper* written six years ago, he used the following words:—"The climatic differences which no doubt exist at our most celebrated watering places are at present but imperfectly understood, and we are in danger of assuming certain conditions as necessary to health; this paper will not be without its value if it calls more pointed attention to the discrepancies which difference of elevation may cause when the best observations are compared together."

Since that time another difficulty had arisen, viz. that of the stands, and at the present time some of the observations were made at the sea level, others on high ground, some in one sort of stand and some in another. To show that these were not imaginary difficulties, he would only go back to the previous morning, and give the returns from three stands which he had in use. They were as follows:—

	Max.	Min.	Daily Range.
A Stevenson stand 50ft. above ground	54°·4	37°·0	17°·4
Stevenson stand on ground	55°·8	33°·3	22°·5
Glaisher stand on ground	55°·8	31°·3	24°·5

He did not mean to say that an elevation of the ground 50ft. high would make so much difference, but elevation did make a difference, as a proof of which he would refer them to a letter in the last January number of "Symons's Meteorological Magazine." The minimum temperature the same night upon a board on the tower was 32°,† and on the ground 23°·8, both boards being isolated. All he would say upon this point was, that he could not reconcile it with their present notions as to the effect of aqueous vapour in preventing radiation. On comparing the temperature returns from a number of places, his different stands included, for the winter of 1876 and 1877, he was surprised to find that Camden Town fitted in well between the first and second. Chiswick had a wider range, and Salisbury wider still. Taking these circumstances into consideration, however perfect the returns from any place might be, he doubted if any one could determine from those returns what class of patients that place was best suited for, or what the climate of the place really was.

Dr. THEODORE WILLIAMS said that he and his father had certain fixed rules which they followed when sending patients to the different health resorts, and they carefully considered before doing so the different climatic features of these places. Some time ago he had read Mr. Buchan's very elaborate paper on the 'Temperature of the British Isles,' and had found there, as by Dr. Tripe's paper, that the mean winter temperature of the south coast decreased from Scilly eastward to the Straits of Dover. He was surprised at the results of the observations at Llandudno, but an explanation was offered in the shelter afforded by the Great Orme's Head, though the warmth of the western current might contribute to them. He preferred actual experience of the climates on invalids to meteorological observations, for he had found from a trial of 250 cases of pulmonary

* "On the Temperature of Hill and Valley." Vol. I. p. 102.

† The system lately introduced into London of building to a great height and letting the houses out in flats, makes these observations of some importance, as they point to the probability that a great difference of temperature is experienced by the occupants of the upper and lower stories.—G.D.

consumption wintering at the various British Channel Stations, that the patients at the milder localities in the west did not progress so favourably as those wintering at the more cool and bracing health resorts (such as Brighton and Hastings) in the east ; and that the largest number of those registered "worse" coincided with the greatest amount of warmth and equability of climate. This he believed was owing to the influence of the equatorial current and its accompanying winds on the west coast. He had found that Madeira (which previously had been spoken of as one of the best places for consumption, and combined warmth and equability to an extraordinary degree) could not compare in results with Egypt, and the dry climates of some other parts of Africa. He would add that the climate of Algiers compared favourably with those of the other Mediterranean health resorts, and that the climate of the whole Mediterranean basin was characterised by dryness and stimulating qualities, of proved utility to invalids. He was sorry that the Society had not a station at such a frequented watering place as Bournemouth, but he trusted satisfactory reports would be furnished from that place.

Dr. MANN said that vegetation was often more enduring and active at inland that at sea-side stations, and as each plant gave out a large amount of moisture, this might probably, in some instances, account for the greater humidity at inland than at sea-side places. According to the experiments of Halesbury, leaves in sunlight keep themselves surrounded by a layer of completely saturated air. The transpiration from leaves amounts, in many instances, to one-tenth of an inch of water per day for the leaf surface. It is well ascertained that the *winter* mean temperatures are higher on the west coasts of Ireland and Scotland than those of the corresponding parallels of the east coasts of England and Scotland. This is due, possibly, less to the heating power of the sea than to the warm air currents that are at that time prevalent, setting in from the ocean shores towards the south and west. The equatorial sea currents cool rapidly as they flow towards the north-east; but they give the greater part of the warmth which they lose to the air, and that air then carries the warmth on to the land which it first encounters.

Mr. GASTER asked for what hours the humidity had been obtained, as the results would depend greatly on the time of day when the observations were made. He moved that the discussion should be adjourned till the next meeting, as he thought the subject far too important to be dealt with in an off-hand manner, and he believed that the phenomena referred to in the paper were capable of easy explanation.

Mr. SOUTHALL believed that fog was caused to some extent in places by the extensive vegetation which could be found near them, and which gave off a great deal of moisture.

Mr. MAWLEY considered that it was a very undesirable precedent that this Society, which had set so good an example by starting a series of Stations, the observations taken at which were strictly comparable, should in any way countenance the detailed comparison of values so utterly unworthy of being placed in juxtaposition.

[The Discussion was at this point adjourned till the next Meeting.]

ADJOURNED DEBATE.

Mr. GASTER said that the statement made in the paper that, during these five winter months, the relative humidity of the air is positively lower on the coast than at the inland stations is one of a nature too serious to go forth unmodified and unexplained. In seeking an explanation, two thoughts suggested themselves : first, the inland stations quoted have, from their geographical position, a mean winter temperature much below that of many of the coast stations, so that, after allowing for a difference between the actual amount of vapour in the air of the two localities, there is still room for the probability that the *relative* humidity inland might be higher than on the coast. But the second consideration is a more powerful, and gives still greater force to the first. It is this: the daily range of temperature inland is very much greater than on the coast; thus we find Kew has a daily range of about 11°, while Falmouth has only 5° or 6°. Now, the observations from which the results in the paper were deduced were made, some at 9 a.m. only, others at 9 a.m. and 9 p.m; the one an early morning hour, when the temperature is

but little above the minimum, and the other a night hour, when temperature is falling. Allowing, therefore, for the increase of temperature in the day time, it might prove that at mid-day the inland stations were the less humid of the two. On investigating the matter, he found that Mr. Aldridge, one of the Fellows of the Society, who is at present employed in the Meteorological Office, had already taken some steps in this direction, with the following results :—Comparing the 1 p.m. observations at Kew and Falmouth in the months of November, December and January (for three years) the mean humidity turned out to be—

In November	Kew	=	79	Falmouth	= 80
„ December	„	=	84	„	= 80
„ January	„	=	82	„	= 85

In this comparison all undue favour is on the side of Falmouth, which is situated on a hill at a considerable elevation above the sea, while Kew Observatory is in a low, flat park, which is occasionally flooded, and lies very near the Thames. Mr. Gaster had, therefore, supplemented the records from Kew for 2 p.m. with those of Stonyhurst, and compared them with the values for Valentia, Scilly and Falmouth, at the same hour. The result is as follows :—

	Humidity at Land Stations, Kew and Stonyhurst.	Humidity at Sea-side Stations, Valentia, Scilly and Falmouth.
November	80·5	82·0
December	84·5	82·3
January	83·5	84·7

These values are from observations made in three years only, want of time having prevented a further discussion of the figures available.

Here, then, we find the rule narrowed very materially, and standing thus :—While in the night and early morning hours the sea-side stations have a lower mean relative humidity than those inland, in the daytime the mean humidity is lower inland than at the sea-side, except during the month of December.

Now, looking at the effect of this on a patient suffering from pulmonary consumption, the fact must not be lost sight of that during the night and early morning hours the patient would be indoors, and probably in bed. His room would be raised artificially to a temperature of say 60° to 63°, and the result of this increase is to reduce the relative humidity in *both* localities, but to bring down that at the inland station to a value *very* much lower at all hours of the day than that on the coast. In the few cases in which the calculation had been made, the air indoors at land stations proved to be from 5 to 10 (in the Scale 0 = perfectly dry, 100 = Sat^{n}.) less humid inland than that on the coast. Mr. Gaster then reverted for a moment to the question of thermometer exposure, but, in the absence of Mr. Dines, would not say much on that subject.

Mr. SYMONS said that he had three stands—Glaisher's, Stevenson's, and Stow's, (single louvred)—and he was pleased to see from the following figures how closely the mean winter values on the Glaisher's and Stow's Stands agreed :—

Mean Excess of Temperatures in a single louvred stand (Stow's Pattern) above the corresponding values on a Glaisher Stand during the months November-March, 1873-77.

Months.	9 a.m.		9 p.m.		Max.	Min.	Mean Daily Range.	Approx. Mean Temp.
	Dry.	Wet.	Dry.	Wet.				
	°	°	°	°	°	°	°	°
November	+·1	+·1	+·3	+·4	·0	+·8	—·8	+·3
December	+·1	+·1	+·3	+·3	+·3	+·7	—·4	+·4
January	+·2	+·2	+·3	+·2	+·4	+·7	—·3	+·4
February	·0	+·1	+·2	+·2	+·1	+·9	—·8	+·3
March	+·2	+·2	+·5	+·4	—·2	+·9	—1·1	+·4
Means	+·1	+·1	+·3	+·3	+·1	+·8	—·7	+·35

The difference between the temperature in the two stands was less in the winte than in the summer, and was also less at 9 a.m. and 9 p.m. than at the coldes and warmest parts of the day. The Stow's Stand did not heat up so much i the summer as the Glaisher's, as the thermometers on the latter screen were ope to radiation from the sky.

Mr. MAWLEY thought meteorologists were, as a rule, rather too fond o figures. We took much trouble in collecting them, and then marshalled them i lines. These lines soon formed companies, these companies regiments, and thes regiments armies; which armies we consider to be so powerful that they can sub due any problem that they may be called upon to encounter, forgetting tha statistics can be made to prove anything, and that there is a logical as well as a illogical way of using them. Now, instead of the mass of figures contained i this paper, and the comparisons in it which are instituted to tenths of a degre of temperature, he would have much liked to have listened to a paper on th same subject without a single figure being quoted. When we have strictl uniform facts such complete comparisons are admissible, but when our facts ar unworthy of such close comparisons being instituted, we ought to content our selves with a few general deductions from them.

The way in which he regarded the subject was this. Our Island being but small one, the differences of climate could be but slight between its variou localities. The differences being so slight, any satisfactory comparison of thes climates must be carried out with the greatest possible delicacy of analysis completeness of investigation and impartiality of judgment. If a similar com parison was desired to be made between the winter climates of some place, sa in Egypt, and that of one of our own towns, for all practical purposes it woul matter very little whether in the one case the thermometrical observations wer taken at the top of the house and in the other down in the cellar, for the mai facts would come out the same under all circumstances, viz. that we are ver much colder and have a very much more humid atmosphere. He had had som reason to take great interest in this subject of our winter climates. Books upo books had been written about them, but all those which he had yet seen con tained more or less of the same misleading and partial comparisons, and had, h considered, done more to bring discredit on observational meteorology in Eng land than anything else.

In a few words he thought he might give a better idea, say of the climate o Ventnor (which, taken all in all, he could not but consider the best of our winte health resorts) than could possibly be gathered from the paper under discussion Ventnor is a few degrees warmer than the neighbourhood of London. Its rang of temperature is less, not only during the 24 hours, but from day to day. I may have a more humid atmosphere during the day, but then the source fro which the sun derives its moisture is in each case totally different. Again, a there is generally a more rapid flow of air over the Undercliff district, there is marked absence of that low-lying mist which so constantly prevails in mos inland places during the greater part of the winter months. It is completel protected from north-westerly, northerly and north-easterly winds. It has sloping situation and a southerly aspect, and is bounded on some part of three o its sides by the sea. Its atmosphere is somewhat marine in character, but cannot be called bracing, neither, on the other hand, could it be considered relaxing. Its weak points are its exposure to east-north-east and easterly winds, whic sweep, often with some force, down the main street. Again, many parts of the town are so sheltered that there the air frequently loses its freedom of movement, and, therefore, somewhat of its life or freshness.

He had read and heard a good deal about delightful climates in different part of the world, and had visited a few places which have some reputation in thi respect but had always found, on reaching them, that the inhabitants strongly re- commended him to seek perfection elsewhere, and invariably expressed a high opinion of the climate of some other place not very far distant. He once met in Melbourne a gentleman who told him that he had been travelling pretty well all over the world in search of a climate where he did not take a chill. He need scarcely say that his search had been but a vain one. There are, however, regions, and these the most extensive on the surface of our globe, whose climates, whethe considered practically or theoretically, are probably the most favourable to the health of human beings to be found anywhere, and yet of which we hear but

little, and these are in moderately warm latitudes at sea—in mid-ocean—quite away from the disturbing influences of any land whatever. There the air will be found not only free, but pleasantly warm, perfectly pure, and extremely equable in temperature and humidity. There the delicate have but few sudden changes of any kind to contend with, and hence have some chance of regaining their lost strength; and there, provided they take the same amount of exercise and live as carefully and well as on land, the healthy will literally overflow with health, strength and spirits. The next perfect climate he imagined would be found on high table lands in warm latitudes, where the air is again free, pure, moderately warm and fairly equable in temperature, and yet withal dry and exhilarating.

Mr. BREWIN did not believe that the figures as given in Dr. Tripe's paper were worthless, and he was extremely glad to hear from what Mr. Gaster had said that different stands gave such similar results. Some one had said in the course of the discussion that the results of different observations were so conflicting that they were worthless and the Society was useless. He did not think so: ever since he had joined the Society one of its great objects had been to secure observations taken under similar conditions, and to impress upon observers the necessity for uniformity in their instruments, in their exposure, and in their readings. A great deal had been done towards this, more remained to be done; and he thought the paper and the discussion on it, when circulated, would be of great use in calling further attention to the matter.

Mr. STRACHAN said the debate had changed about since the previous evening. On that occasion quite an attack had been made upon the accuracy of the observations employed by Dr. Tripe in his paper. Now, however, the accusation proved to be mere moonshine. The difference of screens, which was to upset all results, now turned out to be a bagatelle. For whether a Glaisher's or a Stevenson's screen were used, Mr. Gaster had just told them, made only a difference not exceeding half-a-degree in the hottest part of the year, and that difference might just as reasonably be put down, he thought, to the imperfection of the thermometers. Everybody knew they could not obtain perfection. For his part, he would accept as correct the observations published both by the Society and by Mr. Glaisher, unless he had good reason to question them. Mr. Mawley had made an ingenious and interesting attack on the utility of averages. He wanted everyone to be a meteorologist from ocular evidence mainly. Among other things he said Ventnor was open to east winds, which the visitor there might soon find out; but he said nothing as to the frequency of the east wind, and that was among the things which the averages told them. Of course the argument applied in a similar manner to all other means. The result of the discussion was satisfactory; for it would have been anomalous to cavil with investigators for using results supplied by practised observers. Dr. Tripe well deserved their thanks for his devotion to meteorology, and his trouble in preparing the paper.

Capt. JINMAN had always encountered great difficulty on board ship in obtaining the true temperature of the air. For the sake of safety the instruments were usually placed, either in the skylight, where of course the true temperature could not be obtained, owing to the cabin stove being near it, and also because it often had a large lamp hanging below it, or else the instruments were placed in the smoke room, which was but little better. Some observations were taken in front of the poop, but although that was more correct than either of the previous places, yet it did not give the true temperature, as he had found a difference of 5 in different parts of a ship. In sailing ships especially, the temperature was greatly influenced by the draughts caused by the sails. He did not believe that the observations at Ventnor showed the true sea-side climate, as the position was very sheltered. It appeared that when the wind struck the land under Ventnor, it ascended and passed over, instead of circulating freely through the town. He had been sent to Ventnor last November on account of an attack of bronchitis, and was glad to say that he had derived much benefit from its pleasant climate, and was quite sure that when the facts brought out by Dr. Tripe's valuable paper became known, the value of our sea-side resorts, especially Ventnor would be more appreciated. He wished that observations could be taken on ground gradually sloping to the sea, and then the true sea-side climate would be ascertained.

Capt. TOYNBEE said that the observations which Dr. Tripe obtained from t Meteorological Office were carefully made by good observers from instrumer placed in the open air. The placing of thermometers on board ship was a gre difficulty, because ships change their course and the position of their sai Then again, the thermometers were affected by spray and the artificial heat steamers. Captains were requested to select the most favourable positi possible, so that the observations are as good as we can hope to get, and if we w until perfect observations are available we shall have to wait for ever. No dou the more perfect the observations the more satisfaction there was in discerni them, and it required much more energy to work with imperfect than with perfe data, so that it was all the more praiseworthy of Dr. Tripe to have obtained su good results from data which were not perfect. The motto of all Meteorologi must be, "Take what you can get and do your best with it." With regard the "sling thermometer" (thermomètre fronde), very satisfactory results ha been obtained from it on board ship.

Mr. EATON remarked that an excellent paper by Mr. Buchan, on "The Tempe ture of the British Isles," had appeared in the Journal of the Scottish Meteorol gical Society for 1871. The results were based on observations extending ov thirteen years, January, 1857, to December, 1869, made at 155 stations in Gre Britain and Ireland, and were represented graphically for the year and every mon in the year in a series of maps. Looking at the somewhat miscellaneous sourc of information open to Dr. Tripe, and adopted by him for this inquiry, t apparently greater humidity of the inland stations in the winter might perha in some degree be explained by their lower temperature, and the more freque freezing of the wet-bulb thermometer introducing sources of inaccuracy, whe great attention was not paid to the instrument, which would almost always le to the estimation of the degree of humidity at too high a point; and it must n be forgotten that all carelessness in keeping the wet-bulb thermometer in prop order led to the Dew Point and the degree of Humidity being estimated higher th the truth. He put this suggestion forward for future inquiry, as he thought th any possible explanation of this somewhat unexpected result deserved attentio

Mr. LECKY noticed that the humidity at Valentia had been given as 84; b he knew from actual experience, that when living there the towels in his bedroo never dried in winter.

Dr. TRIPE said that whatever opinions might be entertained as to the value his paper, there had been such a long and an interesting discussion as to l valuable in itself as well as to observers, and he was especially gratified wi that day's discussion, as it had brought out certain facts which showed tl depreciatory remarks on observations hitherto taken to have been based on misconception as to the effects of different screens. He rather regretted th the discussion had been confined chiefly to the humidity tables, and although more extended comparison had shown the probability of the air at inland statio being generally drier at mid-day than at the sea-side, yet his object in drawi attention to this part of the subject had been attained, as it had been the mea of showing that the generally received opinion as to the excessive comparati humidity of sea-side places in winter is an error; and especially as it did n much matter, in a health point of view, whether or not the figures varied a degr or two. He thought Mr. Mawley had not fully considered the bearing of h remarks, as, whilst objecting to companies, battallions, regiments, and armies figures, he (Mr. Mawley) had directly afterwards stated that the climate Ventnor was warmer than other places. Now, how could he have arrived at th conclusion except by a comparison of figures? Dr. Tripe also considered that was much better for physicians to send their patients to localities for which tl humidity, mean temperature, and other meteorological elements of climate a known, and after giving due weight to such statistics, than to send them to health resort of which these facts of climate are not known. Recently careful comparison had been made by Dr. C. T. Williams and others as to tl benefit derived by consumptive patients, when it was found that Ventnor Hastings, and probably Ramsgate, had been more beneficial than Penzanc whilst the latter place is generally more suitable for cases of chronic bronchit than the others, as a bracing climate suited the former and a sedative air tl latter. Torquay is suitable as a rule both for consumptive persons and tho afflicted with chronic bronchitis. He then admitted that the mean humidity

the air at sea-side places is higher than at inland localities during the months of April to October, inclusive, and thanked the Fellows for the interest shown in his paper, and felt flattered by the debate extending nearly over the whole of two meetings, which he did not remember to have previously occurred.

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

JANUARY 16th, 1878.

Annual General Meeting.

HENRY STORKS EATON, M.A., President, in the Chair.

Mr. GASTER and Mr. LECKY were appointed Scrutineers of the Ballot for Officers and Council.

Dr. TRIPE read the Report of the Council and the Financial Statement for the past year. (p. 92.)

It was proposed by Mr. LAUGHTON, seconded by Mr. CASELLA, and resolved:—"That the Report just read be received and adopted, and circulated among the Fellows."

It was proposed by Mr. DYASON, seconded by Mr. DINES, and resolved:—"That the disposal of the Funded Property for the advancement of the objects of the Society be left at the discretion of the Council as heretofore."

It was proposed by the Rev. T. A. PRESTON, and seconded by Dr. TRIPE:—"That Ladies be admissible as Fellows of the Society."

To this the following amendment was proposed by Mr. BREWIN, and seconded by Dr. MANN:—"That the matter be referred back to the Council for further consideration, and to be reported upon to a Special Meeting, if they considered desirable."

On the amendment being put to the Meeting, it was lost, and the original resolution carried.

It was proposed by Mr. SCOTT, seconded by Mr. SILVER, and resolved:—"That the cordial and best thanks of the Meteorological Society be communicated to the Council of the Institution of Civil Engineers, for having granted the Society free permission to hold their Meetings in the Rooms of the Institution."

It was proposed by Dr. TRIPE, seconded by Mr. SYMONS, and resolved:—"That the thanks of the Society be given to the President, for the ability and courtesy displayed by him in the Chair during the last two years."

It was proposed by Mr. DINES, seconded by Mr. GASTER, and resolved:—"That the thanks of the Society be given to the Officers and other Members of the Council, and to the Auditors, for their services during the year."

It was proposed by Mr. BREWIN, seconded by Mr. DYASON, and resolved:—"That the thanks of the Society be given to the Standing Committees, and that they be requested to continue their duties till the next Council Meeting."

The PRESIDENT then delivered his Address. (p. 87.)

It was proposed by Mr. BROOKE, seconded by Captain TOYNBEE, and resolved:—"That the best thanks of the Society be given to the President for his very able Address, and that he be requested to allow it to be printed in the Society's Journal."

The SCRUTINEERS then announced the result of the Ballot, and declared the following gentlemen to be the Officers and Council for the ensuing year:—

President.

CHARLES GREAVES, M.Inst.C.E., F.G.S.

Vice-Presidents.

HENRY STORKS EATON, M.A.
JAMES PARK HARRISON, M.A.
ROBERT JAMES MANN, M.D., F.R.A.S.
CHARLES VINCENT WALKER, F.R.S., F.R.A.S

Treasurer.

HENRY PERIGAL, F.R.A.S.

Trustees.

Sir ANTONIO BRADY, F.G.S.
STEPHEN WILLIAM SILVER, F.R.G.S.

Secretaries.

GEORGE JAMES SYMONS.
JOHN W. TRIPE, M.D.

Foreign Secretary.

ROBERT H. SCOTT, M.A., F.R.S.

Council.

THE HON. RALPH ABERCROMBY.
ARTHUR BREWIN, F.R.A.S.
CHARLES BROOKE, M.A., F.R.S., F.R.C.S.
EDWARD ERNEST DYMOND.
WILLIAM ELLIS, F.R.A.S.
ROGERS FIELD, B.A., M.Inst.C.E.
JOHN KNOX LAUGHTON, M.A., F.R.A.S.
REV. WILLIAM CLEMENT LEY, M.A.
RICHARD STRACHAN.
HENRY SAMUEL TABOR.
CAPTAIN HENRY TOYNBEE, F.R.A.S.
GEORGE MATTHEWS WHIPPLE, B.Sc., F.R.A.S.

Mr. EATON having left the Chair, it was taken by the newly elected President, Mr. GREAVES, who thanked the Society for the honour they had done him in electing him to that Office.

The Meeting was then adjourned.

FEBRUARY 20th, 1878.

Ordinary Meeting.

CHARLES GREAVES, M.Inst.C.E., F.G.S., President, in the Chair.

W. CLINTON BAKER, J.P., Bayfordbury, Hertford;
WILLIAM BERRIDGE, 12 Victoria Street, Loughborough;
WILLIAM MALACHI BURKE, F.R.C.P., Charlemont House, Dublin;
REV. J. A. LEGH CAMPBELL, M.A., F.S.A.Scot., Helpston, Market Deeping;
PROF. JOHN ELIOT, Presidency College, Calcutta;
LIEUT. CHRISTOPHER SULLIVAN FELTRIM FAGAN, R.M., Royal Naval College, Greenwich, S.E.;
CHARLES HENRY HOLDEN, Bolton;
PROF. HENRY JOHN STEPHEN SMITH, M.A., F.R.S., Museum House, Oxford;
CAPT. WILLIAM WATSON, 8 Water Street, Liverpool;
CHARLES WOOLLETT, Acrise, Canterbury; and
MISS ELEANOR A. ORMEROD, Dunster Lodge, Spring Grove, Isleworth, W.,
were balloted for and duly elected Fellows of the Society.

The following Paper was read:—

"On the Winter Climate of some English Sea-side Health Resorts." By JOHN W. TRIPE, M.D., F.M.S. (p. 111.)

On the motion of Mr. GASTER the further discussion of this Paper was adjourned till the next Meeting on March 20th.

Donations received from January 1st to March 31st, 1878.

Presented by Societies, Institutions, &c.

Bombay	Meteorological Office	Brief Sketch of the Meteorology o fthe Bombay Presidency in 1876.
Brisbane.....	General Registry Office..	Report on the Vital Statistics, September to December, 1877.
Brussels	Observatoire Royal.....	Bulletin Météorologique.
	" "	Annuaire pour 1878.
	" "	Annales, May and June, 1877.
	" "	Observations Météorologiques faites aux stations internationales de la Belgique et des Pays Bas, July to November, 1877.
	Société Belge de Géographie	Bulletin, Vol. I. No. 6.
Budapest	Kon. Ung. Central-Anstalt für Meteorologie und Erdmagnetismus.....	Jahrbücher. Band V. 1875.
Copenhagen ..	Danske Meteorologiske Institut	Bulletin Météorologique du Nord, December 1, 1877, to February 28, 1878.
Cracow	K. K. Sternwarte.....	Meteorologische Beobachtungen, December, 1877, and January, 1878.
Edinburgh	Royal Observatory	Astronomical Observations, Vol. XIV., 1870-1877.
	Royal Society	Proceedings, 1876-1877.
Fiume.....	I. R. Accademia di Marina	Meteorological Observations, November and December, 1877.
Greenwich	Royal Observatory	Results of the Magnetical and Meteorological Observations, 1875.
Hamburg	Deutsche Seewarte.....	Wetterbericht.
	" "	Monatliche Uebersicht der Witterung, November, 1876; August to October, 1877.
Leipzig	Sternwarte	Monatliche Berichte über die Resultate aus den meteorologischen Beobachtungen angestellt an den Königlich Sächsischen Stationen, 1876.
Liverpool	Literary and Philosophical Society	Proceedings, 1876-77. No. XXXI.
London	Army Medical Department	Report for 1876.
	Art Union.....	Report of the Council, 1877.
	General Registry Office ..	Weekly Return of Births and Deaths, No. 52, 1877; Nos. 1-12, 1878.
	" "	Quarterly Return of Marriages, Births and Deaths, December 31st, 1877.
	Meteorological Office	Daily Weather Reports and Charts.
	" "	Hourly Readings, April and May, 1877.
	" "	Quarterly Weather Reports, 1875. Parts I. and II.
	" "	Sessional Papers of the Parliament Ontario, 1877.
	" "	Essai sur la Vie et les Ouvrages de L. A. J. Quetelet, par E. Mailly.
	Royal Astronomical Society	Monthly Notices. Vol. XXXVIII. Nos. 2-4.
	Royal Institution.....	Proceedings, No. 67.
	Royal Society	Proceedings, Nos. 184 and 185.
	Society of Arts.....	Journal, Nos. 1311-1322.

London	Society of Public Analysts	The Analyst, Nos. 22-24.
Madrid	Sociedad Geográfica	Boletin. Tomo II. Nos. 4 and 5.
Marlborough ..	Marlborough College Natural History Society ..	Twenty-sixth Half Yearly Report.
Melbourne	Observatory	Monthly Record of Results of Observations in Meteorology, Terrestrial Magnetism, &c., June to October, 1877.
Mexico	Ministero de Fomento ..	Boletin, 1877, Nos. 76-88, 1878, 1-11.
	,, ,,	Observations taken at the Central Meteorological Observatory, at 6h. 7m. a.m., November 16 to December 31, 1877.
Milan	Reale Osservatorio di Brera.....	Sopra alcuni Scandagli del Cielo. Del Prof. G. Celoria.
Moncalieri	Osservatorio del R. Collegio Carlo Alberto	Bullettino Meteorologico, Vol. XII. Nos. 1—4.
	,, ,,	Osservazioni Meteorologiche, November, 1877, to January, 1878.
Oxford.....	Radcliffe Observatory....	Results of Meteorological Observations, 1875.
	,, ,,	Observations of Shooting Stars from October 13, 1876, to December 14, 1877.
	,, ,,	Observations and Delineations of Solar Spots made with the Heliometer, 1874—5.
Paris	Observatoire de Montsouris	Bulletin Mensuel, Nos. 70-72.
	,, ,,	Annuaire pour l'an 1878.
	Observatoire National ..	Bulletin International.
	Société Météorologique de France	Annuaire Bulletin des Séances, 1877, Feuilles 42-44; Tableaux Météorologiques, 1876, 5-17; 1877, 8-13.
Rome	Ministero d' Agricoltura	Meteorologia Italiana. Bollettino Decadico, 1877, Nos. 31-36. Bollettino Mensile, July to September, 1877.
	,, ,,	Supplemento, 1877, Fascicolo III.
	Osservatorio del Collegio Romano	Bullettino Meteorologico, September, 1877.
St. Petersburg.	Physikalische Central-Observatoriums	Repertorium für Meteorologie, Band V. Heft 2.
	,, ,,	Die Temperatur-Verhältnisse des Russischen Reiches, Erste Hälfte. Von Dr. H. Wild.
Stonyhurst....	Observatory	Results of Meteorological and Magnetical Observations, 1877.
Sydney.....	Government Observatory.	Meteorological Observations, October, 1876, to May, 1877.
	Royal Society of New South Wales.....	Journal and Proceedings, 1876. Vol. X.
Upsala	Observatoire de l'Université.....	Bulletin Météorologique Mensuel, January to May, 1877.
Vienna.....	K. K. Centralanstalt für Meteorologie und Erdmagnetismus	Beobachtungen. November, 1877, to January, 1878.
	Oesterreichische Gesellschaft für Meteorologie.	Zeitschrift. Band XIII., Nos. 1-6.
Washington. ..	War Department.....	Monthly Weather Review, December, 1877, and January, 1878.
	,, ,,	Daily Bulletin of Weather Reports, with the Synopses, Probabilities, and Facts, June to September, 1874.
Wellington....	Registrar General's Office	Statistics of the Colony of New Zealand, 1876.
Wellington College	Natural Science Society..	Eighth Annual Report, 1877.
Zürich.....	Meteorologische Centralanstalt der schweizerischen naturforschenden Gesellschaft	Schweizerische meteorologische Beobachtungen, 1875, Part 7; 1876, Part 5; 1877, Part 3.

Presented by Individuals.

Aldridge, E. G.	The Humidity of the Air on the Coast and in the Interior. Letter to the Torquay Directory.
Barham, C., M.D.	Results of Meteorological Observations, Truro, 1876 and 1877.
Bateman, J. F., F.R.S.....	Presidential Address to the Institution of Civil Engineers, January 15, 1878.
Blasius, Prof. W.	Causes of the Huron Disaster.
Clark, J. L., F.R.A.S.	Observaciones Meteorológicas y datos sobre la Reconstruccion de la Linea Férrea de Campana destruida por la Tormenta que tuvo lugar en Mayo de 1877, por E. Clark.
Clarke, H., L.R.C.P.....	Meteorological Tables for West Riding Prison, Wakefield, 1877.
Curtis, J.	Fall of Rain in 1877, at Roseleigh, Heaton Chapel, near Manchester.
Denza, P. F.	Studi sulla Climatologia della Valle d' Aosta.
„	La Corrispondenza Meteorologica Italiana Alpina-Appennina.
Dunlop, W. H.	Results of Meteorological Observations made at Annanhill, Kilmarnock, Ayr, December, 1877, to February, 1878.
„	Abstract of Ditto, 1877.
„	Rainfall at Annanhill, 1877.
Frisiani, Prof. P.	Su Alcuni Temporali osservati nell' Italia superiore (Estate 1876).
Greaves, C., F.G.S.	British Association Reports, 1862-1871.
„	Mathematical Discourses concerning two New Sciences relating to Mechanics and Local Motion, in Four Dialogues. By Galileo Galilei. Translated by T. Weston (1730).
„	Dobbs' Relievo Geological Map of England and Wales.
Hall, A.	Theory of the Revolution of an immense Disc of Ether around the Sun and around each of the Planets.
Hankinson, R. C.	The Weather at Red Lodge, Southampton, December, 1877. to February, 1878 (MS.).
Hoskins, S. E., M.D., F.R.S.	Meteorological Observations, Guernsey, December, 1877, to February, 1878.
Lake, W. C., M.D.	Second Report of the Committee on the Meteorology of Devonshire.
Lindsay, Lord, M.P.....	Dun Echt Observatory Publications. Vol. II.
Loomis, Prof. E.	Results derived from the Observations of the U. S. Signal Service. Eighth Paper.
Marriott, W.	Instructions for taking Meteorological Observations.
Meldrum, C., F.R.S.....	Sunspots and Rainfall.
Merrifield, J., LL.D.....	Meteorological Summary, Plymouth. 1877.
Miller, S. H., F.R.A.S	The Fenland Meteorological Circular, January.
Mohn, Dr. H.....	Askeregnen den 29de-30te Marts, 1875.
Nelson, R. J.	Summary of Meteorological Observations made in Kendal since 1788.
Plantamour, Prof. E.	Résumé Météorologique de l'année 1876 pour Genève et le Grand Saint-Bernard.
Preston, Rev. T. A., M.A.	Notes of Observations of Injurious Insects. Report, 1877.
Punnett, W. C. ...,.....	Summary of a Meteorological Journal kept at St. Mary's, Tunbridge, 1877.
Rous-Marten, C., ...	Anemometry.
„	The Comparative Atmospheric Pressure of New Zealand and Great Britain.
Scott, R. H., F.R.S.....	The American Storm Warnings.
Shoolbred, J. N.	Half Tide Level at Liverpool.
Silver, S. W.	The Colonies and India. Nos. 281-292.
Symons, G. J.	Symons's Monthly Meteorological Magazine, January to March.
„	Mean Rainfall at 97 stations in north-west England, 1867-1876.

Symons, G. J.	Reports of the Rainfall Committee of the British Association, 1874-1876.
,, ...	The Meteorology of Bute, 1876, by J. Kay. With an Appendix containing Abstract of Observations taken from Records kept at the Old Cotton Mills, Rothsay, 1800 to 1875.
,, ...	Institutes of Physics, Vols. I. and III. (1777.)
,, ...	Syllabus of Experimental Lectures on Natural Philosophy, by R. M'Lean and A. Murray (1782).
,, ...	Astronomical Register, October, 1868.
,, ...	Address to the Royal Astronomical Society on presenting their Gold Medal to W. Huggins, F.R.S., and to Prof. W. A. Miller, M.D., F.R.S., for their conjoint discoveries in Astronomical Physics. By the Rev. C. Pritchard, M.A., F.R.S.
,, ...	Physical Geography in relation to Sanitary Science. By A. Haviland.
,, ...	Bulletin de la Société française de Navigation Aérienne 1877, No. 1.
,, ...	Inondations du Département d'Indre-et-Loire, 1846-56.
,, ...	Recherches sur les Météores et sur les Lois qui les régissent, par M. Coulvier-Gravier.
,, ...	Contributions à la climatologie du Danemark. Résultats d'observations faites à 4 stations pendant 15 années.
,, ...	Decensum Mercurii in Barometro Pluvia instante a Guttarum casu derivari haud posse, ostenditur, II. (1718).
,, ...	De Lapide Falminari. By C. F. Höchstetter.
,, ...	Lehrbuch der Ingineur und Maschinen-Mechanik, von J. Weisbach.
,, ...	Das Luftmeer, von E. J. Reimann.
,, ...	Die Feuermeteore, insbesondere die Meteoriten. Von Dr. O. Buchner.
,, ...	Beiträge zur Witterungskunde, von Prof. H. W. Brandes.
,, ...	Untersuchungen über die Wolken und andere Erscheinungen in der Atmosphäre, von T. Forster.
,, ...	Die Ursache der inneren Erdwärme die Entstehung des Erdplaneten, der Feuerkugeln, Sternschnuppen und Meteorsteine. Von Dr. C. F. Hänle.
,, ...	Barometer-höhen-Messungen von dem Kreise Schleusingen im Konigl. Regierungsbezirk Erfurt ausgeführt in den Jahren 1859 bis 1862. Von Major A. W. Fils.
,, ...	Ueber den täglichen und jährlichen Gang der Feuchtigkeit in Russland, von Dr. H. Wild.
,, ...	Ueber die Abhängigkeit des klimatischen Charakters der Winde von ihrem Ursprunge, von Dr. W. Köppen.
,, ...	Also a number of small Pamphlets.
Tarbotton, M. O., F.G.S...	Meteorological Observations and Daily Rainfall at Nottingham, 1877.
,, ...	Rainfall Registers in the Watershed of the Trent, 1877.
Toynbee, Capt. H., F.R.A.S.	On the Great Hurricane, the Tracks of American Storms, and the ordinary Winds of the North Atlantic in August, 1873.
The Editor	Academy, Nos. 296-308.
,, ...	Nature, Nos. 427-439.
,, ...	Sanitary Record, Nos. 184-196.
,, ...	Telegraphic Journal and Electrical Review, Nos. 118-12[illegible].
Turtle, L.	Review of the Weather at Aghalee, County Antrim, 187[illegible]7.
Watson, W. H., F.C.S.....	Meteorological Statistics of Braystones, near Whitehaven, 1877.
Whitmore, J., M.D.	Health and Meteorology of Saint Marylebone, December, 1877, to February, 1878.

QUARTERLY JOURNAL

OF

THE METEOROLOGICAL SOCIETY.

VOL. IV. No. 27.

VI. *On the application of Harmonic Analysis to the reduction of Meteorological Observations, and on the general methods of Meteorology.* By the Hon. RALPH ABERCROMBY, F.M.S.

[Received February 12th.—Read April 17th, 1878.]

THE Author proposes in this paper to illustrate harmonic analysis by taking one meteorological element, namely pressure, and tracing the physical and geometrical meaning of every step from the barographic record till the tabulated results are exhibited in a harmonic series; and also to make a discussion of the use and failure of this series the basis of a few remarks on the general methods of Meteorology.

If we look at any set of barograms, as figs. 1, 2, 3 (p. 153), it is readily seen that subsidiary to the long and great changes of pressure due to the passage of cyclones and other causes, which occur at all hours of the day, there is a diurnal variation consisting of two small *maxima* about 10 a.m. and 10 p.m., and of two small *minima* about 4 a.m. and 4 p.m. Also, that this diurnal variation does not recur exactly at the same hours every day, and that the amount is variable, ranging from 0·01 in. to 0·11 in.

If now a large number of similar barograms are reduced by taking the mean of the height of the barometer at each hour of the day, and the results are plotted (fig. 4, p. 153), we get a curve of the *mean daily barometric pressure*, which on inspection is found to consist of a diurnal range with two *maxima* about 10 a.m. and 10 p.m., and two *minima* about 4 a.m. and 4 p.m., while, by proper measurement, the exact time and magnitude of each fluctuation can be determined.

But comparing this curve with the traces from which it is derived, we see that the result of averaging is to eliminate all the information which might have been derived from them relative to the position or passage of cyclones, squalls, &c., as they occur at irregular hours,—in fact of all that makes up changes of weather, and that only the regular periodic variation is left. Also, that this diurnal mean curve is only the graphical representation of the fact that there is a diurnal variation of the barometer, which is usually of certain magnitude and occurs usually at certain hours; but the curve gives no clue to the cause of this variation, beyond the obvious inference that, as its period is one day, the sun is probably the primary agent.

If, as seems probable, a series of barometric observations during an arctic winter show no signs of diurnal variation for any single day, but the average pressure at every hour is taken, it is most unlikely that for a few months' observations the irregular cyclonic variations will exactly balance. The resultant curve of daily mean pressure will therefore be an irregular line, whose fluctuations have no physical meaning, but represent the fact that the cyclonic variations have not balanced in so short a time.

If now we take the same series of figures representing the mean pressure at every hour of the day, and combine them by Bessel's formula, we get a harmonic series of the form $P = A + B \sin(\theta + C) + D \sin(2\theta + E) + \&c.$, and if we plot the curve represented by the above equation with the proper coefficients, we find that it is almost identical with the former curve of mean daily pressure. In fact, this formula gives, in a single expression, the whole of the isolated tabulated values in a very convenient manner; and as the coefficients can be calculated for any number of different places, it is easy to compare the respective characters of their diurnal variation; so when mean values are used, harmonic analysis is the most convenient and perfect method of averaging.

But it is most important to observe that a harmonic series can be made to fit any arbitrary function whose law is unknown, but of which numerical values can be determined; that in this case the formula only gives the numerical, but not the physical law of the variation of the barometer, by expressing, in mathematical language, the fact that, at a certain hour, the pressure is a certain distance from the mean, without any reference to the physical cause, so that it is merely the *algebraic embodiment of a fact*. It is also evident that nothing more is learnt from the harmonic series than from inspection of the curve formed by plotting the mean values directly.

But there is another totally different view of a harmonic series, which has been very strongly advocated by Sir W. Thomson, viz. that when the numerical values of a physical phenomenon are reduced to a harmonic series, each algebraical term corresponds with one of the physical constituents of the total variation represented by the whole series. Each term of such series represents that class of motion called *harmonic*, which in a simple form he has shown to play a prominent part in physical science, as, for example, in questions of pendulum motion; while the more complex harmonic series he has used with great success in tidal investigations; and after expressing the

attraction of an iron ship on a compass in such a series, he and others have shown how to correct the effect of each term separately. The general idea seems to be that as a matter of observation harmonic action is almost a great physical principle; and that just as in complex waves the primary wave is naturally subdivided into 1, 2, 3, &c. parts, so in complex harmonic motion the primary is naturally subdivided into motions corresponding to θ, 2θ, 3θ...&c.; so that in thus analysing an unknown function into harmonic constituents, we have a great engine of discovery, and not merely a formula that puts into short compact form a number of isolated facts, or that approximates to an arbitrary function.

There is the same divergence between these two ways of looking at a harmonic series, as there would be between considering the expansion of an unperiodic function, derived from its observed numerical values, in a series of terms of x, x^2, x^3...&c. either as merely a mechanical analytical formula, or as the expression in each term of a separate geometric or physical fact.

The author does not feel competent to enter into the general principles involved either in harmonic motion, or the curious analogies which can often be traced between analytical symbols and physical phenomena; but from a meteorological point of view, and considering only the diurnal varation of the barometer, he would remark, that neither method gives much clue to the physical cause, beyond the probability that it has something to do with day and night.

It is almost certain, that the diurnal variation of the barometer is due to the daily variation of temperature and vapour, both statical and dynamical; and when these causes have been discovered, it will no doubt be possible to exhibit their average course mathematically, as the sum of harmonic variations, in the manner Kaëmtz has already unsuccessfully attempted to do; but the author maintains, that the discovery of causes must be derived from direct observation of each day's variation on its own merits, as will be explained more fully in another part of this paper.

We see, then, that whichever way we look at harmonic analysis, its value must depend on our estimate of the use of averages, or of the statistical method generally in meteorology, a point which it is proposed now shortly to discuss.

We have seen that the result of averaging barometric observations is to leave the fact of a periodic diurnal variation; and a similar process applied to other meteorological elements has given rise to the discovery of—

1. An annual variation of pressure.
2. A diurnal variation of temperature.
3. An annual variation of temperature—a somewhat irregular curve in this country, but several of whose fluctuations Buchan has shown to be due to the periodic recurrence of certain types of pressure distribution.
4. Diurnal and annual variations of vapour and humidity.
5. Diurnal and annual variations of the strength and direction of the wind.

The above are all of the class of periodic variations; but another large and

most useful class of statistical results have been derived, by taking the statistical value of different elements, and considering their amount either locally or by comparison with surrounding places. For instance, the mean temperatures of the year or month, though giving a very small idea of the real climate, have been grouped to form isothermal maps, which have been of considerable value to meteorology. Again, by taking the mean direction of the wind at different parts of the earth, sailing routes have been greatly improved; while by collecting rainfall statistics, much useful information has been derived, both as to the distribution of rain and the capabilites of local water supply.

The above are some of the more prominent results of the application of statistics to Meteorology, and their mere enumeration is sufficient to show what a step in the history of Meteorology the introduction of these methods effected; but it is now necessary to examine where these methods fail, and why they can never raise Meteorology to the rank of an exact science.

The failure of statistical methods may principally be referred to three causes: 1. That when applied to the fluctuations of any one element, they only take hold of periodic phenomena, as the process of averaging eliminates the effect of cyclones and anticyclones. 2. That of these periodic phenomena, averages only give the facts of their variations, and often furnish no clue to their causes or laws. 3. That when applied to the amount of any one element, or to the discussion of synoptic maps, phenomena are often classed together which are not really identical, but have only one common property.

We will now consider these sources of failure separately.

I. The elimination in these results of the effect of cyclones and anticyclones, leads naturally to the consideration of what part synoptic charts must play in the future study of Meteorology. Though such charts have been constructed for more than twelve years, meteorologists are by no means agreed as to their use or meaning, and the author therefore proposes to make a few remarks on their relation to the general problems of Meteorology, and to point out the method of attacking certain questions by their means.

In the first place, the study of synoptic charts gives an answer to the question "what is weather?" Weather is the product of the passage of cyclones or anticyclones over any place. In temperate regions, the circulation of the atmosphere, the general scheme of which is at present entirely unknown, always takes broadly the form of cyclones or anticyclones, whose position and shape are in a state of perpetual change; subject to numerous local, diurnal, seasonal and other variations, the weather at any part of either always possesses the same character; so that the weather over any area, at any instant, is the result of their position; and the sequence of weather, over any spot, is the result of their motion. Hence the problems for the meteorologist to solve as regards weather are: 1. To determine the character of cyclone and anticyclone weather, which would give the explanation of the observed weather at any moment, over any area—a very complete solution of which is certainly possible. 2. To explain the

observed sequence and variation of each element over any spot, by defining the position and motion of the cyclones or anticyclones that have passed over it. This can already be done to a great extent, and a very complete solution is possible. 8. To study the motions of cyclones and anticyclones, so as to discover the nature and laws of their changes; so that, given their position at any moment, their future course and resulting weather may be forecast. Very little progress has been made in this direction, and it is impossible to say how much is possible.

If this general view of weather be correct, Meteorology is essentially an observational science, for the physical conditions are not such as can be reproduced in the laboratory, nor are the results capable of being expressed in mathematical language or in simple maxims. An interesting analogy can be shown with geological methods. Just as the meteorologist explains the weather over any area at any moment by the presence of cyclones and anticyclones, with their local and other variations, so the geologist explains the existing features of any area by the presence of upheavals, crumplings, and their denudation; and just as the meteorologist forecasts the future course of cyclones, with their resultant weather, by the study of their past motions, so the geologist will some day perhaps forecast the future position of new upheavals and crumplings, with the corresponding change of scenery.

The views just enunciated point to a great change in the way of looking at weather prognostics. If every part of a cyclone or anticyclone has a characteristic appearance, then every prognostic must be studied by reference to the synoptic conditions during which it is observed, and all that any such prognostic can do is to enable an observer to identify his position relatively to the cyclone or anticyclone. Thus a watery sky is a sign of rain, because it is characteristic of the front or east side of a cyclone, and as a cyclone usually travels eastwards, an observer will successively be subjected to the influence of the cloudy and rainy parts of the cyclone before an area of fine weather again reaches him. Again, visibility, with an overcast sky, is a sign of rain, because the general condition of circulation in the atmosphere, shown by straight isobars, during which it is observed, is never persistent for long, but works up to a cyclone and rain. Visibility with a cloudless sky is characteristic of the NW edge of a cyclone, and is a sign of rain when, as frequently happens, that cyclone is quickly followed by another. On the other hand, when that is not the case, visibility is sometimes the precursor of persistent dry NW or NE winds. An observer with telegraphic information could often forecast the result by considering the surrounding pressure, but all a single observer can do is to identify his place in a cyclone.

The following is an illustration of an important class of questions, whose solution can already be roughly sketched since the introduction of synoptic charts. From them it is easily seen that the position of persistent anticyclones, and of areas of depression that are constantly traversed by cyclones, are often roughly defined by the distribution of land and sea; and some day, when this is more worked out, it will be possible to say what alteration in climate would be produced by a change in the position of land and sea.

For instance, in winter there is usually a persistent anticyclone over Siberia, which stretches across Central Europe, while the North Atlantic is covered by a persistent area of depression, in which cyclones are constantly formed in such a position as to leave England traversed by warm SW winds. Observations on the general circulation of the atmosphere show conclusively that the Siberian anticyclone is due to the cold radiation from land. Hence, if Siberia were submerged, the anticyclone would disappear, the Atlantic cyclones would be able to move east, and, with a larger proportion of west winds, the climate of England would grow colder.

By a similar course of reasoning only would it be possible to solve the question which has been so much discussed, what the effects on the climate of Europe would be of a submergence of the Sahara, but the conclusion is not so obvious.

Again, there is another class of question that it has been attempted to solve purely by statistics, but which the author ventures to think can only be satisfactorily handled by reference to synoptic charts, viz. the connection of rainfall with sun spots.

Take for example the rainfall in the north of Scotland for 1872, a year of sun spot *maximum*. In that year, following an exhaustive paper on the subject by Mr. Buchan, the rainfall over a small area in the Valley of the Dee, above and about Aberdeen, was 75 per cent. above the average, while within 120 miles of this area, in a NW direction round Cape Wrath, there was a large region where the rainfall was below the average.

Taken as bald statistics, it would be difficult to say from this whether rainfall was increased or diminished by a sun-spot *maximum*. But if we consider the synoptic history of that year, we find that it was characterised both by a great diminution in the number of large cyclones moving in a NE direction at some distance from Great Britain, which expose our west and north-west coasts to wet SW winds, and leave our east coasts comparatively dry; and by a great increase of small cyclones and secondaries, both of which are always very wet, crossing our Islands in an E or even SE direction, thereby greatly increasing the rainfall on our east coasts, and in the case of cyclones going SE into the German Ocean, often leaving our north-west coasts comparatively dry.

It appears, therefore, in this case a year of sun-spot *maximum* was associated with a very well marked and readily described variation in the usual synoptic conditions of the whole of Western Europe; and if this is confirmed in future years, it will then be safe to connect sun-spots with the general circulation of the atmosphere, which can never be done so long as we consider only one meteorological element. In connection with this it may be observed that the year 1877, a sun-spot *minimum*, was remarkable for the small number of secondaries which crossed Great Britain.

Similarly with regard to the connection of Indian rainfall and sun-spots, it seems doubtful whether pure statistics can ever lead to a satisfactory result. Indian rainfall is so local, and so dependent on one or both monsoons, that unless the rainfall returns are carefully considered from a

meteorological point of view, and daily synoptic charts constructed to show if there is really a cyclical variation in the position or force of the monsoons, we shall never be justified in asserting that there is a real physical connection between sun-spots and weather.

There is a further great advantage in this method of treating the question of sun-spots. The same synoptic investigation which is required to deal with rainfall, such as has been given for the year 1872, also supplies the explanation of the decrease of temperature, increased proportion of west winds, and unusual number of thunderstorms observed over Western Europe in that year. We shall recur to this subject in another part of the paper.

Allusion will be made in a note at the end of this Paper to the peculiar method of treating mean values adopted by some meteorologists in discussing Indian rainfall; but it may be well here to introduce a few remarks on attempts which have been made with reference to periodic rainfall, and to the connection between diurnal variation of pressure and wind, and to discover a mathematical *criterion of periodicity*. What has already been explained with reference to the harmonic curve of mean daily pressure is capable of extension to every algebraic expression—viz. that it only expresses, in symbolical letters, facts or ideas which might be expressed more cumbersomely in words. Hence it is as impossible that there should be an algebraic criterion of fact as a logical touchstone of what is true; that is to say that letter symbols discover no more than word symbols. Therefore it is evident that if we have two sets of phenomena to compare, which can both be shown graphically in a similar manner, no mathematical combination can either alter or improve the judgment which the eye will form as to their probable coincidence or otherwise.

The consideration of the foregoing questions as to change or recurrence of climate and weather brings forward very prominently a great want, which synoptic charts may be used to supply, viz. a description, in synoptic terms, of cold, hot, wet, dry and stormy seasons, &c. or of long tracts of weather, as referred to the position and motion of cyclones and anticyclones.

One source of increased cold has been already mentioned as depending on the position of cyclone paths; but much cold in winter is due to the presence of anticyclones with their radiation; and there are probably other conditions of wet years than those of 1872: and till these and similar groups are properly defined and classified, we shall never be able properly to discuss questions of climate or to say that the recurrence of any one element is more than a coincidence.

Before leaving this subject, the author wishes to make a few remarks on the attempted application of statistics to the discussion of synoptic charts, which up to the present has not led to much result, nor does he think it ever will.

We have seen in our remarks on barometric fluctuations that in dealing with irregular cyclones and anticyclones, if there are no constant periodical phenomena, a mean value is only the arithmetical result of certain unbalanced observations. For instance, the exact direction of the wind at any part of a

cyclone is variable, depending principally on the position of the steepest gradients, so that the mean direction of the wind at that point merely signifies that it is usually in that direction, but does not say what it would be in any given type of cyclone.

Again, the velocity of a cyclone may be anything from 50 miles an hour E to 15 miles an hour W, so that it is very obvious the mean velocity of a cyclone has no physical meaning, but only states an arithmetical result, and is of no use in forecasting the path of any particular cyclone. Some day, however, it is very probable that an experienced forecaster will be able to forecast approximately the rate and path of a cyclone by considering each case on its own merits.*

To carry out the investigations referred to in this part of the paper it is evidently absolutely necessary to construct synoptic charts for certainly the whole northern hemisphere, and probably also for the southern hemisphere, for by no other means will it ever be possible to discover that general scheme of the circulation of the atmosphere on which the whole science of meteorology appears to rest. Also, that the publication of good barograms must be multiplied, for without them it is impossible to trace cyclones and the still more puzzling surges or waves of pressure which override equally cyclones and anticyclones.

II. Before dealing with the second reason of the failure of averages, viz. that when applied to periodic variations they only give the facts and not the causes, the author wishes to point out the position of diurnal periodic phenomena generally in meteorology.

If we look at any set of synoptic charts, we see that the cyclones and anticyclones seem to go on their course tolerably independent of day or night; while, if we look at any set of meteorograms, as in the Quarterly Weather Reports, we see that every element has a diurnal variation.

In some, as in barometric pressure and direction of the wind, the diurnal variation is small compared to the cyclonic; while in others, as in temperature and velocity of the wind, the diurnal variation is large as compared with the cyclonic. An inspection of any set of barograms, as figs. 1, 2 and 8, shows that the diurnal variation of pressure is simply a small fluctuation overlying either cyclone or anticyclone; and an inspection of synoptic charts for any hour shows that the direction and force of the wind are always determined by the position of cyclones and the steepness of gradients; while in a former paper the author has shown that the general character of the appearance of weather is determined by the position of cyclones, though modified by a diurnal variation: whence the conclusion seems to be that the primary character of weather, in its broadest sense, is determined by the position of cyclones and

* It should be observed that throughout this discussion, by the word "cyclone" is simply meant that roughly circular area of low pressure, and by "anticyclone" that roughly circular area of high pressure, of which specimens may be seen on any large synoptic chart, so that any connection between them and observed weather is only the association of two sets of facts, and the adoption of these words involves no theory whatever.

anticyclones, while every element has a diurnal variation superimposed on the cyclone character.

We have seen, in discussing pressure variation, that the result of taking the mean value for every hour of the day is to eliminate the effect of cyclones, and leave only the fact and average amount of the diurnal variation. Also, that whether we consider the variation as an observed fact, or as a harmonic component, we have no clue to its cause other than considerations as to the hours of its occurrence may suggest.

In the following remarks the author does not profess to solve the question of diurnal barometer variation, but merely to show the means by which only he believes the solution ever can be worked out. The method proposed is simply, instead of taking mean values, to take every day on its own merits, and to observe what kind of weather is associated with large diurnal and what with small diurnal variation, and how different kinds of weather affect the times of *maxima* or *minima*.

For instance, once during the summer of 1877, in London, there were several fine days at the edge of an anticyclone, during which, though one would usually have expected a considerable 4 a.m. *minimum*, the barographic trace showed very slight indications of any; the author observed that on those mornings there was an unusual amount of wind about 4 a.m., and if this is ever confirmed by future observation, it would point to the conclusion, that wind is not conducive to the formation of the 4 a.m. *minimum*. Then, as to the 10 a.m. *maximum*, if we look at the barographic trace for May 27, 1877, given in fig. 1 (p. 158), we see that superimposed on the general rise of the barometer between 4 a.m. and 11 a.m. there is a very slight depression. The author's observations for the day are not very complete, but a similar depression is very common, and in many cases he has observed it to be associated with the temporary formation of heavy clouds about that time of the day. If this also is confirmed by future observation, it would point to the conclusion that either overcasting of the sky or the formation of cloud interfere with those statical or dynamical changes which produce the 10 a.m. *maximum*. Then, as to the 4 p.m. *minimum*, Buchan has conclusively shown that at Valencia, and over the North Atlantic generally, it is smaller in summer than in winter; while at Kew, and in continental Europe generally, the reverse is the case, and even within so short a distance as fifty miles the author has observed that the kind of weather which would give a large 4 p.m. *minimum* in London, only gives a small one at Brighton, clearly pointing to the influence of land or water on the production of this variation.

The author has also pointed out in a former paper that there are critical periods of the formation or disappearance of cloud or fog superimposed on the general cyclone or anticyclone character of weather corresponding with the hours of diurnal barometer *maxima* and *minima*, and by combining all the above, and many other observations of a similar nature, it will certainly be possible some day to explain these diurnal variations.

The author doubts whether meteorologists realise how constant a phenomenon diurnal pressure variation is in this country. His own barograph has

only been going about five months, but he has not yet seen a single day in which some diurnal variation was not visible. Owing to cyclonic variation, it is rarely possible to measure the absolute amount each day, but the eye readily judges the comparative magnitude from day to day if a straight edge is placed close along the curve.

He would also remark, that the chief interest of diurnal barometer variation lies in the difficulty of explaining it, for an inspection of the barograms illustrating this paper, and the general argument, will show that it is simply a very secondary phenomenon, superimposed on cyclones, and that even if we were now in possession of its complete explanation, we should be no nearer a knowledge of the laws of cyclone motion on which all weather forecasting depends.

A similar line of observation will be necessary to discover the cause of the numerous other diurnal variations which are still unexplained by meteorologists, and of which any combination of mean values can only give the facts. Passing from unknown to known causes, the method proposed may be compared to taking the mean temperature of every hour of the day, which we shall find is represented by a single-headed curve, with a *minimum* about 4 a.m and a *maximum* about 2 p.m. Then, if the recognition of the fact did not suggest the cause, by taking many single thermograms, and observing that a small diurnal range is produced by cloud—which at night reduces the cold, and by day reduces the sun's rays,—also that a temporary clearing of the sky might make the minimum at almost any hour of the night, and the maximum at almost any hour of the day—and that these changes are always secondary to those produced by cyclonic alteration in the direction of the wind,—we should conclude, even if it were not otherwise obvious, that terrestrial radiation by night, and solar radiation by day, were the causes of the diurnal range of temperature.

III. We now come to the third source of failure in the use of averages to make meteorology a science, viz. that when applied to the values or occurrence of any element, phenomena are treated as identical which have really only one common property. Take, for instance, the occurrence of rain; the commonest occurrence of rain in this country is in cyclones, accompanied to a single observer by a sharp fall of the barometer, as seen in fig. 2 (p. 153), for April 4th; but heavy rain also often falls in thunderstorms, with a characteristic sharp rise of the barometer, as shown in the baraogram for the same day, at the point marked *ts* on fig 2, and also, more rarely, with a flat barometer associated with secondaries, as shown in fig. 3 for July 1st, 1877, where rain began about the end of the small step-like fall of the barometer a little before 6 a.m., and continued during the time of steady barometer till the second step-like fall, about 4 p.m. We see, then, that there are certainly three distinct states of atmospheric motion which are associated with rain, and therefore, deductions drawn from the mean value of rainfall, which masses all these sources of rain together, must necessarily fail to be of any scientific value.

Again, there are several sources of cold weather in this country; for it may either come with an E wind, and a high pressure over Norway, or with NW

wind, and high pressure to the NW of Scotland; or else with the calms and radiation of an anticyclone, stretching northwards from France. So if we take the general circulation of the atmosphere, as shown by synoptic maps, to be the ultimate cause of weather, we have at least three different conditions of such circulation, differing in many points, but with one property in common, —namely, cold; and if we attempt to generalise on the recurrence of cold merely from records of a low thermometer, without reference to the synoptic conditions of its occurrence, we are treating as identical, phenomena which have really only the one common property of cold, and the results can only lead to error and confusion.

A similar line of argument might be applied to every meteorological element. The importance of thus discriminating between different kinds of any phenomenon, is most seen in discussing questions of cyclical variation and recurrence, as may be seen by reference to what has been said, in a former part of this paper, relative to the connection between rainfall and sunspots.

The above method of dealing with questions of rainfall also helps to show very clearly where statistics are useful and yet fail to make a science.

If mean rainfall is wanted for questions of water supply, it is immaterial under what conditions it falls; but not for scientific purposes.

Again, for astronomical observations, as, for instance, deciding from statistics whether Possession Island was suitable for observing the transit of Venus, cloud is cloud, and neither the kind or quality are material; but if ever meteorology is to be a science, it is of the utmost importance to discriminate between the different kinds, and determine their position on synoptic maps relative to cyclones and anticyclones.

So also with regard to wind. For sailing purposes a fair wind is a fair wind, from whatever cause it blows; but for meteorological science it is most important to discriminate its origin. In this country NE wind may come from at least four different sources, so that treating every NE wind as identical must certainly tend to no good result.

The discovery of the best sailing route across the equator is one of the most useful results of the application of meteorological statistics, but owes its success entirely to the fact that in those parts the direction of the wind and distribution of pressure is very constant. At the present time, when the methods of meteorology are so much under discussion, the author believes it would be well worth trying whether an equally good, or perhaps better route might not be discovered by drawing on a synoptic chart for every day of a given month the best route apparent from the observations, and then taking the mean for the month of all the routes thus determined. This method has the further advantage, that the same investigation which gives the route also gives the reason as referred to the distribution of pressure.

Such appear to be the principal reasons why averages, though so useful for many practical purposes, can never make meteorology a science, and also the method by which some progress seems possible. If a distinctive name were wanted for that method, it might be called the *Specific Method*, since it

endeavours to discover causes by dealing with specific instances rather than by massing many results together.

The author regrets that the limits of a paper do not permit him to touch more than lightly on many important points, but trusts that his remarks may be considered a small contribution to a discussion on the methods of Meteorology.

The contents of this paper may be summarised as follows:—

The meaning of harmonic analysis is first shown, in reference to average daily barometric pressure, by tracing the geometrical and physical significance of every step from the barogram till the tabulated results are combined in a harmonic series.

It is then shown that, whether we regard this series simply as an algebraic embodiment of a fact, or as a series of harmonic components, as suggested by Sir W. Thomson, it is simply a method of averages, and our estimate of its value must depend upon an estimate of the use of averages at all in meteorology. It is then pointed out where averages are useful, and their failure to make meteorology an exact science is traced to three causes.

1. That the process of averaging eliminates the variable effects of cyclones and anticyclones, on which all weather from day to day depends; and on this is based some general remarks on the use of synoptic charts not only in explaining and forecasting weather, but in attacking such problems as the influence of changes of the distribution of land and water on climate, and the cyclic recurrence of rain or cold.

2. That deductions from averages only give the facts, and not the causes of any periodic phenomena. The position of diurnal and other periodic variations in the general scheme of meteorology is then pointed out, and it is shown that their causes can only be discovered by careful study of meteorograms from day to day.

3. That in taking averages, phenomena are often classed as identical which have really only one common property. For instance, rain in this country is associated with at least three different conditions of atmospheric disturbance, and it is necessary to discriminate between these kinds before meteorology can be an exact science.

Note on the Figures.

As the reproduction of meteorological records is of some importance, the following remarks may be of interest:—

The original traces were drawn by an aneroid barograph (by Breguet) on smoked paper. Fig. 1 was copied in the usual manner from the original. Figs. 2 and 3 were engraved by the Typo-etching Company of London, who employ photography to reproduce the original on a metal block suitable for ordinary printing. Though greatly superior to hand copying, these copies are not so good as ordinary photo-printing or Woodbury type.

Fig. 4 is an ordinary wood engraving.

FIG. 1.

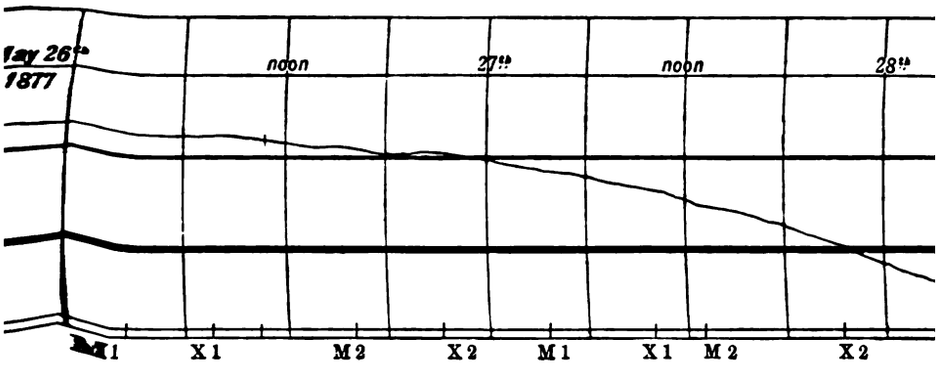


FIG. 2.

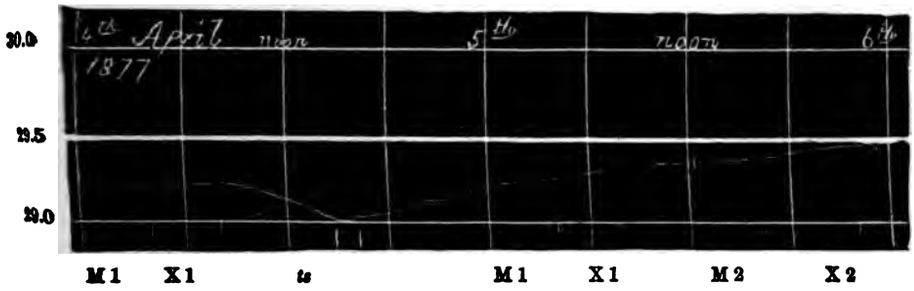


FIG. 3.

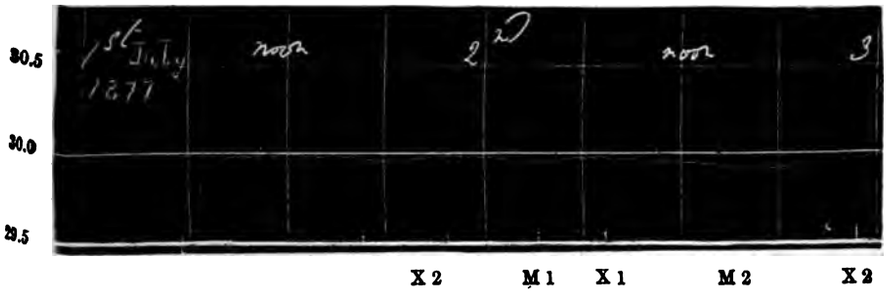
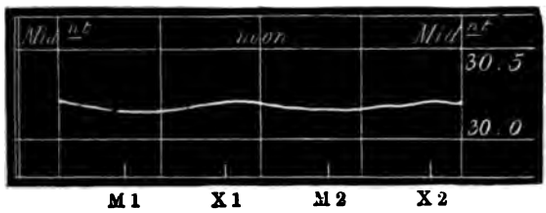


FIG. 4.



EXPLANATION OF FIGS.

M 1	M 2	Morning and Afternoon	*Minima.*
X 1	X 2	,, ,,	*Maxima.*

NOTE ADDED JUNE 17TH.

The following are additional illustrations of the idea of harmonic components. In the first place it should be noted, that in a harmonic series no combination of terms containing θ can give rise to terms involving 2θ, 3θ, &c., so that if the diurnal variation of the barometer is due to the interference of the temperatures and pressures of dry and moist air, it could not be expressed as a harmonic series. Also that the whole principle of the propagation of harmonic components involves the independence of the causes represented by θ, 2θ, &c. As this view of the subject is little known, the author may perhaps give the following extract of a letter from Sir William Thomson to himself, dated January 28th, 1878, relative to a part of the preceding portion of this Paper. "Take for example the diurnal barometric variation. This depends entirely on the sun's heat, while the semi-diurnal harmonic constituent largely exceeds the diurnal. Now in the thermometric variation the diurnal harmonic constituent greatly exceeds the semi-diurnal. If we could set aside the disturbing influence of cyclones, we should probably find that the diurnal harmonic constituent of the barometric variation would be the same as if there were no semi-diurnal variation of either barometer or thermometer, and the diurnal variation were what it is. So of the semi-diurnal, we should probably see it to depend simply on the semi-diurnal harmonic constituent of the thermometer. This is undoubtedly a key towards a physical explanation of the barometric variation. It is probable that there is a fundamental mode of simple harmonic vibration of the atmosphere suitable for excitation of the semi-diurnal harmonic variation of temperature, whose period agrees much more nearly with 12 hours than with 24 hours, the period of a harmonic vibration suitable for excitation by the diurnal simple harmonic constituent of the thermometer. The subject is at present quite open for mathematical theory; but the mathematical investigation, if not helped, will at all events be rendered more fruitful by extensive data from observation analysed into the two terms of diurnal and semi-diurnal periods, with proper treatment for the variations of the amplitudes and epochs of these terms for the season of the year." The whole question, then, of the application of harmonic analysis to meteorology turns round how much meteorologists are prepared to accept certain dynamical principles connected with vibrations as an explanation of the observed phenomena, and whether, up to the present time, any trace of such vibrations has been discovered; a question on which the author does not wish to enter here.

Allusion was made in the discussion on this Paper to a method of averaging adopted by the late Mr. J. C. Bloxam in reducing his 16 years' observations at Newport; and as this method has been recently adopted by some meteorologists with reference to Indian rainfall and sun-spots, a short account of it in his own words may be acceptable. After pointing out that the difficulty to be contended with in determining the mean annual daily temperature by

simply ascertaining the mean values belonging to a long series of years for each day is the liability, in the reducing process, to obliterate the normal as well as the abnormal irregularities which belong to the secular variation in cycles, he goes on to say that his values were reduced by the following method:—

"There being 16 consecutive years to deal with, it is better to combine the whole of these together in mean values; but if there had been 20 or 30, or any larger number of years to deal with, it might have been better to dispose of these in successive groups of 12 years each, in the same method as that used for the successive days. The method used for this purpose has now to be explained:—it is founded on the principle that the mean value of 9 or 11 consecutive days gives more accurately the normal value for the central date of the 9 or 11, as the case may be, than the identical value which may happen to fall on that date; and so, the value assigned to each day in the year is the mean value of a given number of days on each side of its own date: the number of days adopted for the means is 10, this being by far the most convenient number for calculation; and the whole series of 365 days are thus made up of decadal means;—the first mean value representing the decade 1—10, the second 2—11, the third 3—12, and so on: the date for the first mean value is then $5\frac{1}{2}$, that for the second $6\frac{1}{2}$, and so on. This process having been carried on all through the year, the new series of mean decadal daily values thus obtained is in turn treated in the same way; and now the dates become whole numbers again. This process is reiterated until the resulting values constitute regularly increasing and decreasing quantities,—*and no longer;* except that in consequence of using the number 10, it becomes necessary always to have an even number of reductions, in order to obtain whole numbers for the dates. By proceeding in this way the normal irregularities are preserved, whilst the small irregularities, which can only be accidental, are sufficiently obliterated from the thermometric values by repeating the process four times over. The same is the case with the dew-point values, but with the other particulars a twofold reduction is found to suffice; but in order to reduce the thermometric values to one line of *constant* ascent and another of *constant* descent, it was found necessary to repeat the process 22 times. It may elicit some useful facts to carry the process to this extent, but for general purposes, and more especially for the purpose of determining the daily normal values, it becomes a process of derangement rather than of correct arrangement."

Now if we look at any 10 days' successive thermograms, as in the Quarterly Weather Reports, it is easy to see what the meaning is of taking the mean temperature for each day, and then the mean of the 10 days, namely: that a mean temperature of say 50° tells very little about the kind of weather, for it may either be the result of a *max.* and *min.* of 65° and 35° in fine weather, or of 55° and 45° in dull, overcast weather, and that massing all 10 days together completely destroys their individuality; but it is very difficult to say what the meaning of a mean decade of the second order would be; in fact, it is very doubtful whether it has any except an arith-

metical significance. The result, however, of the process is easily traced. As a matter of fact, in this country the annual march of temperature is not a uniformly ascending and descending line, but has interruptions of cold periods, notably about February 10 and May 14, owing to the recurrence, about these dates, of cold anticyclones; and we see that Mr. Bloxam's test of the utility of his process is the disappearance of these important facts. The author finds, for instance, from Mr. Bloxam's own tables, that the mean temperature for February 11 derived from the mean average of the 16 years is 86°·94, while the value obtained by a fourfold decadal reduction is 88°·66, and that obtained by a 22-fold reduction is 89°·48. The result, therefore, of the process is to destroy what meaning the original curve possessed, and the author believes that a similar result must necessarily attend any other application of the method. If the curve of mean daily temperature is plotted, the periodical irregularities are detected at a glance, and in every case of cyclical recurrence the author believes the graphical to be superior to any arithmetical process.

During the discussion, too, some Fellows seemed to think that the author wished to ignore statistical methods altogether, but such is by no means the case. He wished to show that averages are very useful as a convenient way of stating facts; but that the distance from the mean, which in many branches of science is of primary importance, has no physical significance in meteorology.

DISCUSSION.

Mr. SYMONS said that as the author had not referred to the method of averaging adopted by the late Mr. Bloxam in his book on "The Meteorology of Newport," he was doubtless unacquainted with it, but it was well worth consideration.

Mr. STRACHAN said that the author of this paper had displayed great ability in dealing with the subject, however little justification there might be in objecting to the statistical method. He, for one, would be glad to know that the statistical method could be dispensed with, as then, the onerous drudgery of reducing meteorological observations would be greatly lessened. There were three methods of exhibiting the results of observations:—(1) the arithmetical, which consisted purely of figures; (2) the geometrical, which appealed to the eye by means of curves; and (3) the algebraical, which embodied the same results in a formula. Each method had some advantages. The arithmetical was the direct result of computations, and was fundamentally indispensable, and of course the most accurate. In the geometrical method accuracy is dependent somewhat upon the scale to which the curves are drawn, and it affords an easy way of arriving at the maxima, minima, and singular points, &c. The algebraical formula ought to be an equation to the curve; as a matter of fact it is so with considerable leakage, and to be at all correct it must always be deduced from a series of observations, made for many equidistant points on the curve. Arithmetical averages could not be dispensed with in any respects, though meteorologists might do very well without using much the geometrical or the algebraical representations of the results. No doubt the synoptic method of dealing with observations promised much, but the fact was that the main part of the science, as it at present stood, had been built up by the statistical method. During the last twenty years much work had been done on the synoptic principle with not very extraordinary results, simply because this method demands an enormous number of observations made simultaneously on an unlimited extent of the earth.

Dr. TRIPE said that he considered Mr. Abercromby had done good service to meteorology by so forcibly pointing out the value of the synoptic method, but he thought that the statistical method had been unduly depreciated. He deemed

it very essential to obtain the average of a number of observations in order to determine the climate of a place, and afterwards the synoptic method could be employed to ascertain what meteorological conditions produced, not only ordinary changes in the weather, but more especially the departures from the means; as by tracing to their sources the causes of them, we should most probably arrive at conclusions more quickly than by applying the synoptic method to ordinary changes in the weather.

Capt. TOYNBEE said that he thought it an excellent paper, especially where it referred to the value of synoptic charts. The Marine Branch of the Meteorological Office had just completed a work on "The Meteorology of the North Atlantic during August, 1873," &c.&c., which contained a synchronous chart for each day of that month. These charts give the navigator most useful information, and tell at a glance the reason why certain routes across the Atlantic are the best. Facts which had been elicited by the discussion of an immense number of logs, which extended over a great number of years, were, as it were, graphically pictured by the synchronous charts of a day. The great difficulty is to get a large number of simultaneous observations over any great extent of sea or land: in some parts it is quite impossible. Still, he was very glad that this paper called the attention of meteorologists to such important wants, as no doubt the North and South Atlantic, if not other parts of the sea, might be dealt with in this way.

Capt. JINMAN had noticed that the words "cyclone" and anticyclone" occurred very often in the paper, and would like to have a clear definition of their meaning. He was well acquainted with Mr. Piddington's views, the proposer of the word cyclone, but did not hesitate to say that they were erroneous.

Mr. C. HARDING said that he considered the synchronous method of discussion of very great importance, and thought the present paper brought forward very clearly certain advantages to be derived from that method. The synchronous charts for August, 1873, in course of publication by the Meteorological Office, exhibit very plainly a picture of the cause of certain conditions over the North Atlantic—for instance, the NE trade blows very persistently on the eastern side of the Atlantic, but is drawn into an E and even SE wind on passing to the western side of the Atlantic—the whole being due to the existence of the permanent area of high pressure in mid-Atlantic. He thought that for marine meteorology the synchronous method of discussion had still further advantages. There is considerable difficulty in obtaining various means for spaces of the ocean; for instance, if discussing 5° squares, we get a ship in one of these spaces on a certain day, and perhaps no other ship in the same space for another year, and the mean for the adjacent 5° square may be formed from observations made at altogether different times. Synchronous charts allow us to draw isobars, &c. over the ocean, and thus to fill in with a fair approximation to the truth the synchronous observation in each 5° square. He was at that time testing this method by discussing the results in the North Atlantic for August, 1873, and hoped to give the results in the form of a paper to the Society. With respect to the treatment of meteorological observations by the harmonic analysis, he thought that mathematicians would do well to consider from the data already existing the value and meaning of the various co-efficients, and not recommend the harmonic treatment unless there seems a fair opportunity of a satisfactory solution to the several parts of the harmonic series:—he considered that for *meteorology* its chief use was that of an interpolation formula.

VII. *On some peculiarities in the Migration of Birds in the Autumn and Winter of* 1877-78. By JOHN CORDEAUX.

[Received February 13th.—Read April 17th, 1878.]

THE Autumn and Winter of 1877-78 have been remarkable for their extreme mildness. On the north-east coast of England, from the middle of September to the end of November, the prevailing winds were from points varying from WNW to SSE, and there was not a single gale or even a strong breeze

during that period from N, NE, or E. This long continuance of favourable passage winds for the birds has been apparent on our east coast by the general scarcity of the usual autumnal immigrants arriving from the North of Europe. With few exceptions they have passed overhead without showing themselves, or alighting for temporary repose. This is always the case in a favourable migrating season. It is a well-ascertained fact that birds migrate the best, and with the greatest ease to themselves, against a moderate head wind, or one a "few points free." There is also during the present season another reason for the scarcity of immigrants, the unusually mild winter in Scandinavia having induced many to remain long after their usual time for leaving the north. So that the migration of any particular species, which on a whole extends over a period of from four to six weeks, has this season been greatly prolonged, and presented much more of a desultory character, than is the case in average years.

In America, or rather the Nearctic region, the heat and cold being more extreme, the movements of the birds are more sudden and complete than in the Western Palæarctic regions, where the autumnal migratory movement is carried on more gradually, although, normally, when once commenced it goes on uninterruptedly, till the great movement to the south is completed, towards the middle or end of November. In the present season of 1877-78 this southward flow of the bird tide has been much more protracted than is usually the case; as an illustration, I will take, out of several, the cases of the blackbird, fieldfare, and woodcock. The first flights of the former species arrived on our north-east coast after the great gale from the SW on the night of October 14th. There was again a great influx of blackbirds coming from the north on or about the 26th of November, and the two following nights; this immigration extended, as I have ascertained from the notes kindly supplied to me by the principals of lighthouses in our north-east districts, nearly the whole length of the Yorkshire coast-line, also in north-east Lincolnshire. Mr. Gätke, of Heligoland, an ornithologist having a European celebrity, writing to me from that island, January 21st, says:—"For some weeks we have had every day some woodcocks, also some blackbirds." Again later, "February 2nd, wind E in the morning, N and N by E in the evening. *Turdus merula*, from 20 to 40, as I fancy from the north."

The first flight of fieldfares arrived in north-east Lincolnshire from the 18th to the end of October. Since this date they have come in at intervals during the winter. As late as the end of January, Mr. Gätke writes from Heligoland: "January, night from 27th to 28th. *Turdus pilaris*, countless flights." Woodcocks have been exceptionally scarce, my first notice on the north-east coast was from Seaton Snook, Durham, October 5th; all through January some appear to have touched daily at Heligoland.*

Although the weather has been on the whole remarkably and abnormally mild in the north of Europe, we have had at intervals some short bursts

* Great numbers of woodcocks passed the No. 5 Tees Buoy Lightship on the 20th and 21st of October. Wind W and SW, with rain.

severe weather, frost and snow, lasting only a few days. The effect of these rapid variations of temperature has been to drive the laggards in the north southward, not gradually, but as it were, in sudden rushes, corresponding with the outbreaks of bad weather in the north. There was one such rush on October 27th. A correspondent writing from one of the floating light-ships at the mouth of the Tees says:—"27th, strong breeze and cloudy; barometer at noon 29·60 in., thermometer 58°. Two woodcocks and great many crows this day; large flocks of lapwings came in from east all day, also large flocks of wild ducks and a great variety of other small birds. They appear to come in from ESE. I never observed so many birds come over in one day before."

Again, Mr. Gätke, writing from Heligoland, November 14th, says:—"Wind SW, but moderate, and although cloudy, there is no rain. During the night there was a great rush of thrushes, larks, lapwings, robins, and fire-crested wrens (both *Reguli*), intermixed with lots of other birds. . . . What do we read out of this? That there is in the north an appearance of winter driving off the migranes helter-skelter."

Again, I may instance the great rush of fieldfares over Heligoland on the nights of January 27th and 28th.

At the same time Mr. Gätke sends the following note:—"*Colymbus septentrionalis*, 29th January, from 9 a.m. and earlier to 4 p.m., an uninterrupted stream of birds from NNE to SSW, passing to the east of this island, constantly from eight to twelve in focus of glass."

This extraordinary rush of red-throated divers, coming doubtless from Scandinavian waters, was caused by the same outburst of severe weather which drove the fieldfares southward on the nights of the 27th and 28th. We had in England some severe weather from the 23rd to the 27th of January coming from the WNW and NW, frost and snow.

The red-throated divers may have delayed their movements southward in consequence of the unfrozen state of the Scandinavian fiords. Another reason causing the stay of these and other large divers in the north, may have been the extraordinary influx of herrings into the Kattegatt, and from thence into the fiords. This is more remarkable when we consider that the herring fishery has been practically extinct on this coast through the disappearance of the fish since the year 1808.

Fear of trespassing on valuable space induces me to bring these remarks to a conclusion. I think, however, enough has been said to show the abnormal character of the season, with reference to the autumnal migration of birds from the north of Europe to the south.

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

MARCH 20th, 1878.

CHARLES GREAVES, M.Inst.C.E., F.G.S., President, in the Chair.

Ordinary Meeting.

BENJAMIN LEIGH SMITH, M.A., F.R.G.S., Oxford and Cambridge Club, Pall Mall, S.W., was balloted for, and duly elected a Fellow of the Society.

The adjourned Discussion on Dr. TRIPE'S Paper, "On the Climate of some English Sea-side Health Resorts," was resumed and concluded. (p. 111.)

The following Papers were read:—

"Notes on the occurrence of Globular Lightning and of Waterspouts in Co. Donegal, Ireland." By M. FITZGERALD. (Communicated by ROBERT H. SCOTT, F.R.S.)

The following is my experience of Waterspouts and Lightning:—On the 6th of August, 1868, this neighbourhood being free from the dense black clouds that hung over the mountains of Glenswilly and Glendoan, I went up the latter glen to note anything worthy of observation. On arriving at Meenawilligan, the sky was so black over Bintwilly (Bin Tuile, the height of floods), where lightning and thunder were following each other in rapid succession, that I turned homewards in case the rain should overtake me. When I reached Folbane, on looking behind, I noticed a globe of fire in the air floating leisurely along in the direction of Church Hill. After passing the crown of the ridge, where I first noticed it, it descended gradually into the valley, keeping all the way about the same distance from the surface of the land, until it reached the stream between Folbane and Derora, about 300 yards from where I stood. It then struck the land and re-appeared in about a minute, drifted along the surface for about 200 yards, and again disappeared in the boggy soil, reappearing about 20 perches further down the stream; again it moved along the surface, and again sunk this time into the brow of the stream, which it flew across and finally lodged in the opposite brow, leaving a hole in the peat bank, where it buried itself.

If it had left no marks behind, I confess that, as I had never seen anything of the kind before, I should hesitate to describe its movements, which surprised me much at the time, but the marks which it left behind of its course and power surprised me more.

I at once examined its course, and found a hole about 20 feet square, where it first touched the land, with the pure peat turned out on the lea as if it had been cut out with a huge knife. This was only one minute's work, and, as well as I could judge, it did not occupy fully that time. It next made a drain about 20 perches in length and 4 feet deep, afterwards ploughing up the surface about 1 foot deep, and again tearing away the bank of the stream about 5 perches in length and 5 feet deep, and then hurling the immense mass into the bed of the stream, it flew into the opposite peaty brink. From its first appearance till it buried itself could not have been more than 20 minutes, during which it travelled leisurely, as if floating, with an undulating motion through the air and land over one mile. It appeared at first to be a bright red globular ball of fire about 2 feet in diameter, but its bulk became rapidly less, particularly after each dip in the soil, so that it appeared not more than 3 inches in diameter when it finally disappeared. The sky overhead was clear at that time, but about one hour afterwards it became as dark as midnight. Thunder and lightning accompanied the darkness, and such torrents of rain fell as I have never seen fall before or since, except on the 5th of August this year (1877), when another waterspout fell on the village of Church Hill. On the 20th June, 1877, two waterspouts fell near Bintwilly, which is 1,112 feet above sea level. From time immemorial this hill has been famous for waterspouts, as its name indicates—The Mountain of Floods. Flying clouds passed by it till about 11 a.m. After this they settled

upon its summit, and gradually darkened until the mountain became obscured in pitch darkness, lit up occasionally by lightning, succeeded by thunder.

About 12.30 a vivid flash of lightning struck and tore up the hill-side for a considerable distance between the Bintwilly and the Meenirroy road. This was immediately followed by a loud peal of thunder, and succeeded by such a torrent of rain that the flood came rushing abreast down along the whole mountain side about 6 feet high, carrying everything before it. The rain lasted only 15 minutes, and then the sky and the mountain became as clear as ever. The brightness was, however, of short duration, for the clouds soon collected again *over and around Bintwilly;* but this time the darkest clouds (some of which were as black as ink) rested over Glendoan until about 1 o'clock p.m., when a flash of lightning tore up the solid rocky bed of Crologhy River. Thunder and torrents of rain followed immediately. The rain of the first waterspout was confined to the south side of Bintwilly, while that of the second extended from the summit of Glenveagh Mountains to Bintwilly. The area of the first rainfall was about half a mile square; the second followed the south side of the mountain range through a space about three miles long and a quarter of a mile wide. The second waterspout lasted about 20 minutes; and both in the course of 35 minutes destroyed over £2,000 worth of county property on the roads.

On the 5th of August this year (1877) from 11 till 11.15 a.m. a waterspout fell directly over and around my own residence. At 11.15, during a thorough downpour, I went purposely and placed a circular tin can on a hill at the back of the house, and 10 minutes afterwards I measured 2 inches in depth of water. That would make 3 inches of rainfall within the area of the spout in a quarter of an hour. The extent of this area was about 6,000 feet by 2,000 feet, which gives the enormous rainfall of 3,000,000 cubic feet in 15 minutes.

Before this fall occurred the sky was very black, and a dense, foggy mist hid almost everything 100 yards from me, so that I am certain that I was in the midst of the cloud that formed the spout upon its dispersion by lightning, which occurred at 11 a.m. One flash struck the bed of the river on the north side of Leifrin, carrying off some thousands of tons of material, and spreading them over the valley below, and partly demolishing a bridge on its way. Another flash at the same time struck and split a solid cliff of syenite on the shores of Gartan Lake.

About the year 1869 a spout, preceded by lightning and thunder, fell at the head of Glenveagh, and the electric discharge—not the spout—tore away the mountain side along a small stream 40 perches long, 4 perches wide, and 10 feet deep on an average. The spout that followed swept the loose materials into the valley below. Not a year passes but more or less injury is done by lightning somewhere in this mountainous country, and in almost every case it follows the course of running water, which leads me to suppose there is a strong attraction between the two. Lightning passed under the gable of Mr. Benson's house, tore up the floors of the kitchen and parlour, filled the house full of sulphurous fumes, and went out under the opposite end without doing any other mischief. It also passed through McGinly's byre, killed two cows and tore up a tree and some sticks after leaving it. This is the second visit it has paid Mr. Benson's house. About three years ago it tore up a large tree in Sockar and killed two cows in a field along the same stream, but a herd who stood between the cows escaped, though rendered senseless for a while.

"Notes on a Waterspout." By Captain W. Watson, F.M.S.

October 12th, 1877, 1.30 p.m.—Nimbi rising between ENE and SSW (true) and driving to the NE. 2.30 p.m.—A long arch of nimbi rising in the SSE. 2.40 p.m. a large waterspout forming on the lower side of the arch, which passed away to the NE, its nearest approach to the ship not being less than three miles.

At 3.30 p.m., in lat. 40° 58′ N, long. 59° 57′ W, wind SWby S, force 4 to 5, and quite steady; heavy nimbi from NE to SSE, a portion of which had passed over the ship with heavy rain; the western horizon quite clear; overhead detached nimbi, with torn and ragged edges, but with little motion, as could be determined against the cirro-cumulus seen through the openings in the lower clouds. Saw the water agitated 300 yards south of the ship; in a couple of

minutes the disturbance had increased to 30 feet in diameter, and the spray was carried to a height of 20 feet, having a rotation contrary to the hands of a watch, and moving to the NE with an apparent velocity of 20 miles an hour. Seeing that if the ship were kept on her course she would run through the meteor, and having a desire to see as much as possible of its formation, I kept her before the wind and allowed it to get on the bow, when I hauled the ship up and ran across the wake of it. All this time the clouds in the zenith were closing and becoming dark and dense. At 3.30 p.m. it was 500 yards NE of the ship, and as it passed more to the NE the clouds above it gradually closed and at 3.32 p.m. formed a mass of dense rolled nimbi, the lower part of which assumed a distinctly conical form, the disturbance on the water not being perceptibly increased. At 3.33 p.m. a point was plainly seen on the lowest part of the cloud which gradually became elongated and which went on increasing until the column had reached half down to the horizon. As the tube elongated the water beneath became very much agitated, and was whirled in the air with a rapid gyration, from the centre of which the lengthening column drew fresh supplies of water.* At 3.38 p.m. the column extended 5-6ths of the way towards the sea, when the disturbance was very great, having a diameter of at least 1,000 feet, and the spray rising to as great, if not a greater height. At this time it seemed to have attained its greatest velocity of rotation, which was contrary to that of the hands of a watch: it continued in this condition for a couple of minutes, when it gradually dispersed.

During the continuance of this phenomenon the wind was steady, both in force and direction, with a few drops of rain at short intervals; nor could I discover any signs of rain within a distance of a mile from it. The weather continued squally for some hours.

Note on a supposed Waterspout in the Ochil Hills, Perthshire, extracted from accounts in the 'Alloa Advertiser' for September 1st, 1877. (Communicated by R. H. Scott, F.R.S.)

Up to Monday night (August 27th) there had been unusually pleasant weather for a few days, but during the night rain began to fall in torrents, and continued until a late hour next morning. It was not simply a heavy rain, but a terrific and incessant downpour. In Alloa and the immediate neighbourhood the streams were much swollen, and the rivulet Fairy Burn covered the high Tullibody Road for about 300 yards to the depth of 2 feet. At Tullibody and Cambus the Devon overflowed its banks, and submerged several fields, doing much damage to the crops. It was at Tillicoultry, however, that the deluge attained its most alarming height and violence, owing to the close proximity of the Ochils and the Devon, and caused the loss of two lives. About half-past seven o'clock on the Tuesday morning a great darkness overspread the sky, the air became thick and murky, and of the colour of a London fog. The rain, already fearfully heavy, came down in denser volume with hissing and long-continued rumbling noises, something like thunder. When the hills became visible, they presented a strange spectacle of wildness, being white with tumbling cataracts. Foaming torrents rushed headlong down the beds of the mountain burns,—every runnel had become a river, and every hollow the channel of a stream. Some aver that they heard the sound of the advancing flood,—others that they saw it come like a strong wave. With a suddenness that startled all, the water of the burn overflowed its well-built banks, and flooded the streets in its course down to the Devon. The force of the water was simply tremendous, carrying with it boulders of more than a ton weight. The strong stone bridge soon yielded to the force of the current,

* In reply to a question on this subject, Captain Watson writes:—
It would be more correct to say:—"From the centre of which the lengthening column *appeared* to draw fresh supplies of water." As a matter of course I have no proof that it really did draw a supply of water from the sea; but when the column from the cloud appeared to be within 600 feet of the surface, the spray all seemed to be attracted to it. What is the column composed of? Is it vapour or water? In this case it appeared to me to be far too dense for a mass of whirling vapour, as it showed black against the dark background, and gave the looker-on an impression of something solid. I have seen a great many waterspouts in my journeyings to and fro, but this was, without exception, the largest I ever came across. I judge when at its greatest development the column itself must have had a diameter of 60-ft. to 80-ft. I am certain I am within the mark, as I was careful as to the distance; and as I have paid some attention to that matter, I think you may rely on the measurements not being overdone, in fact they are understated.

the arch not affording sufficient passage. All traffic was suspended, and the factories were closed for the day. In this place alone the damage done to buildings, streets, and bridges is estimated at not less than £8,000. Alloa, Dollar, Menstry, and other places in the Devon Valley, while sharing in the general rainfall, received less damage, as the hill streams of the localities were able to give egress to the large floods that flowed through them. A great deal of speculation has been excited as to the cause of the fearful floods described above. The question is often asked—Were there waterspouts in the Ochils, or were the heavy rains of the preceding night sufficient to account for the sudden rise of the mountain torrents? It is generally conceded that the rains alone cannot account for the floods. Repeatedly the fields along the river banks have been submerged to a greater depth than was on them last Tuesday, and it would seem that the rains alone cannot explain this. On this hypothesis, too, it would be hard to account for the alarming suddenness with which the burns rose in Tillicoultry and Dollar. It would appear that a special cause alone can account for the floods, and almost all are agreed that the unusual, but not improbable, phenomena of waterspouts can alone explain the suddenness, the volume, and the narrow area of the floods. Such phenomena have appeared in the Ochils on former occasions,—happily at great intervals.

DISCUSSION.

Mr. BROOKE thought that the electrical explanation of waterspouts was the correct one; if electricity and magnetism could be shown to be merely dynamical phenomena of gyratory molecular motion (as he had long believed them to be) then the influence of the earth, considered as a huge subjacent magnet, on a vertical electric current of high potential, would readily account for the gyratory motion observed in a waterspout.

Mr. WHIPPLE suggested that in the event of the phenomenon being purely electrical, if the ship passed over the area of the disturbance the compass would probably have been affected. He would like to know whether this had been noticed by Captain Watson.

Captain TOYNBEE remarked that Captain Watson said nothing about the action of the waterspout on his compasses, but he would ask him whether he had noticed any effect. He had heard of thunderstorms having an effect on ship's compasses, but not of waterspouts having such an effect.

Captain JINMAN said that in certain circumstances waterspouts had no effect whatever on the compass. Where the belts of clouds interlaced waterspouts were formed, and lightning was visible between the belts.

Mr. SYMONS said, that as the question of waterspouts had hitherto received but little attention, he should move that the Discussion be adjourned till the next Meeting, when, doubtless, many valuable remarks would be offered.

The PRESIDENT (Mr. Greaves) said that the question of waterspouts was a difficult one to deal with. They were far beyond the reach of averages, and there was great disagreement as to their origin. Some writers in meteorological works ascribed their origin to a rolling motion communicated to a portion of atmosphere lying between two opposite currents of air, while others assumed a generation out of electrical action. He had seen waterspouts, but not near enough to detail the sequence of action in their formation or progress, but he had once witnessed the play of sand-whirls on an extensive bank of fine sand, laid bare and dry at low tide in the bed of the Hooghly River. These, which were yards in height, continued in a regular succession from one end of the sand bank to the other, and were extinguished by running into the water, which did not take up the action. But sand-whirls are not at all uncommon in India, being frequent in the northern provinces. They had been well observed by a Mr. F. H. Baddeley, a surgeon in the Bengal Army, who had accompanied his work with a series of pictorial illustrations and geometrical diagrams of their action and motion. Waterspouts were seen in the Mediterranean, and sometimes in the English Channel. He had once written out an account of two seen by a relative near Guernsey. The subject was extremly interesting, but a moot point was whether the sea-water was lifted up into the whirling part, or whether that was only the vapour of the clouds let down, it being asserted to be

fresh and not salt. A determination of this feature would help to solve some of the doubtful points, and he would commend the endeavour to get near enough to catch some of the spray to any enterprising Fellows who found themselves face to face with a waterspout. The tremendous downpour of rain described in the Irish Paper reminded him of similar gales and ravages described by Sir Thomas Dick Lauder as having occurred in 1829 in Morayshire, and he hoped that further instances might have been recorded. The Discussion would be adjourned to the next Meeting, when it was hoped some Fellows would be able to relate with some precision the sequence of action in the waterspouts or dust whirlwinds. His own idea was to refer them to electrical causes. Globular lightning was described, though only from indirect evidence, in Arago's essays. The lightning seen by Mr. Fitzgerald appeared of a similar character, but the nature was most singular and unnatural, and further evidence was most desirable.

"Observations of Rainfall at Sea." By W. T. BLACK (Abstract).

These observations of the rainfall at sea were taken by rain gauges established on board several vessels both of the Royal Navy and Mercantile Marine during the space of nearly five years, and on both long and short voyages, and in various seas. They were divided into sections belonging to the Northern and Southern Hemispheres, and these were arranged into columns for each month of the year and summed up into total amounts of rain, rainy days, and rate of fall per diem.

In the Northern Hemisphere the totals were 101·93 in. of rain, 175 wet days, and 0·582 in. of rate per wet day.

In the Southern Hemisphere the totals were 93·97 in. of rain, 244 wet days, and 0·385 in. of rate per wet day.

These figures showed that there was heavier rainfall in the Northern than in the Southern Hemisphere, but fewer days on which rain fell, and that the rate was greater also in the former than in the latter, demonstrating the absence of equatorial rains, and a greater preponderance of drizzly weather in the Southern Hemisphere.

The month of September (north autumn) had the heaviest rainfall, 26·05 in., and the greatest number of wet days, 33, in the Northern Hemisphere. The month of April (south autumn) had the most rainfall, 17·68 in., and the month of August the most wet days, 35, in the Southern Hemisphere.

The least amount of rainfall in the Northern Hemisphere occurred in March, 0·68 in., and the least number of wet days, 5, in March also. The least rainfall in the Southern Hemisphere was 0·40 in., in October, and one wet day in the same month.

The spring may, therefore, be assumed as the period of minimum of rainfall at sea, and the autumn as that of its maximum prevalence in both Hemispheres, but at different times of the year.

The rates of rainfall per wet day seemed to vary according to the greater or less quantity of rain falling, and in the Northern Hemisphere was least, 0·136 in., in March, and highest, 0·789 in. in September. In the Southern Hemisphere the rate was least, 0·167 in., in July, and highest, 0·570 in., in April.

Mr. Black then discussed the rainfall according to zones, &c., but the data on which his conclusions were based were evidently insufficient.

The Meeting was then adjourned.

APRIL 17th, 1878.

Ordinary Meeting.

CHARLES GREAVES, M.Inst.C.E., F.G.S., President, in the Chair.

PROF. HENRI MARIE DAVY, Director of the Montsouris Observatory, Paris;
CAPT. NIELS HOFFMEYER, Director of the Danish Meteorological Institute, Copenhagen;

PROF. DOMENICO RAGONA, Director of the Royal Observatory, Modena; and DR. ALEXANDER WOEIKOFF, St. Petersburg,
were balloted for and elected Honorary Members of the Society.

DISCUSSION ON WATERSPOUTS AND GLOBULAR LIGHTNING.

Mr. SYMONS thought that there was much vagueness in the use of the term "waterspout." He believed that so-called waterspouts were often nothing more than very heavy rain; although, of course, it was difficult to draw a line between the two. Nearly three years ago a cloud (the form of which was described respectively as a cart rope and an elephant's trunk) travelled from Oxford to Banbury over a surface of dry ground, but happening to pass over a pond, it sucked up the water, fishes, &c., and presently deposited the whole in another field. This, he believed, explained the showers of frogs, fish, &c.; and, probably, so-called "black rain" was only dirty water, sucked up from ponds, &c. There were scores of proofs of this uplifting force, such as, *e.g.*, a waggon being lifted over a hedge 5 ft. high, and landed in an upright position on the other side; and also of overlapping roofs being torn off barns and deposited at a distance from their former position. A waterspout, he believed, was a mass of vapour of a conical form, rapidly rotating, with a vacuum in its centre. He was glad to see that the theory of "fork" lightning being only in reality "globular" lightning was so generally received. He himself had expressed the same opinion 20 years ago, when collecting reports of thunderstorms, but the idea was laughed at. On account of the globe travelling at such a rate, an impression of a line of fire was left on the retina, as when a stick of wood with one end alight is passed rapidly round it appears to produce a fiery circle. As for chain lightning, that was caused by the globe passing at a slower pace, or else by the perception of the observer being more acute, and the appearance was then as of a succession of links. He then read the following extract from a letter from Miss E. A. Ormerod, F.M.S. "On the night of Thursday, July 25th, 1872, we had most extraordinary lightning. A little before ten in the evening there was a constantly recurring glowing of electrical light to the north, in a narrow horizontal layer, about a third up the sky. The light glowed, and as it were ran backwards and forwards in a narrow layer from N. to N.E. or not quite so far, sometimes as flame-coloured, sometimes lighter, once appearing in a pillared shape in the general glow above the cloud. About half an hour later it appeared occasionally as dishes or globes of light about twice the apparent diameter of the moon, rolling backwards and forwards in the general layer of lightning or electrical light. The dishes were then of a rather deeper primose colour than the strip of lightning (the horizontal narrow layer) in which they moved. The glows of light came almost incessantly later in the night, four whilst I counted eleven as nearly as I could guess to seconds time; and between 2 and 3 a.m., when a heavy thunderstorm burst, the trees and landscape were lighted up as if they were molten silver, sometimes pale gold—the absence of shadows making the light perfectly dazzling. Previously there had been no thunder with the display of electrical light, and it did not light up the landscape; the compass needle was quite steady on a large one I sometimes use as a galvanometer; the light was so unusual I thought it might possibly be magnetic and affect it, but it did not."

Capt. TOYNBEE read the following note from Capt. WATSON:—As to the waterspout being produced by electricity, I certainly noticed no lightning, nor did the officers on deck during the time the waterspout was visible. While the waterspout was in sight I was engaged looking at it, but as it disappeared I told the fourth officer to compare the compasses; they were exactly as they had been at noon. I am inclined to think they were not affected. I have had my compasses on many occasions affected by a thunderstorm, particularly on three occasions when the ship was struck by lightning. On the first, in an iron ship, the needles were demagnetized so completely as to be useless; fortunately we were off the coast of Ireland, and went into Cork for new cards, &c. On the other occasions, in wood ships, the needles were not affected to the same extent. During a severe thunderstorm the compasses will fly round, and backwards and forwards, in the most remarkable manner. This will sometimes continue for a couple of hours after the lightning has passed; the cards gradually coming to rest.

Dr. TRIPE had been told by Mr. Scott that he had observed when a schoolboy

forked lightning assume a globular form at the angles. He (Dr. Tripe) had witnessed two kinds of globular lightning, one descending, the other ascending. The first, which was of a steel colour, descended from a cloud, ran along a road for some distance, and then disappeared, nor was he able afterwards to find where it had gone. The other, which was of a bright yellow, and appeared as large as a cricket ball, came out of the ground, ascended, at first slowly, and then more rapidly, before starting off as forked lightning, and passed into a cloud, after describing three angles. After a short time another ball appeared, passed into another cloud, and finally disappeared, as before, as a flash of forked lightning.

Capt. JINMAN thought care should be taken in determining whether the phenomena described were waterspouts or merely the effects of whirlwinds, as there was a wide difference in the mode of formation. The formation of the true waterspout was always accompanied by the cloud above, the descending cone, or trunk, and the raising and agitating of the waters beneath. The whirlwind is formed by the meeting of different currents of air. When at the Island of Jiblee, on the coast of Arabia, he had had many opportunities of watching their formation and effect: when on the island they threw up columns of dust; but, on striking the sea, they threw up columns of water; but there was no cloud above, and no cloud appeared necessary to their formation, as in the case of the ordinary waterspout.

Mr. LECKY considered that electrical action was very apparent as the cause of waterspouts, for a mass of vapour, as the cloud would be, being possessed of one species of electricity, would naturally induce the other species in the surface of the sea, and the two species, in the act of uniting, would produce the phenomena as represented; but how the cloud became electrified with the single species, to the exclusion of the other, was, to his mind, a subject which required elucidation. He also thought that there must be some variation in the conditions of tension in the masses of vapour, which in one case produced waterspouts, in other cases such a discharge of electricity as existed in the thunderstorm of that forenoon. Sandstorms in the deserts must also be attributed to the same cause, but under peculiar circumstances; as two gentlemen present, confirmed their occurrence in a cloudless sky. He instanced an example of one, doubtless faithfully illustrated in "Atkinson's Tour to the Upper Amour" river in Siberia.

Mr. SYMONS mentioned that some very good illustrations of whirlwinds, &c., would be found in Dr. Baddeley's "Whirlwinds and Dust Storms of India."

Capt. TOYNBEE called attention to the following quotation, as a proof of the height and force of whirlwinds over heated land:—

"Over a large portion of the level tract the grass had been recently burnt, and the ground was covered with its blackened ashes, which blew up into our faces as we walked along, and made us look like a set of sweeps. Numerous small circular whirlwinds swept across the plain, carrying up clouds of ash and dust. One of these of unusually large dimensions rose rapidly, not far from us, in a cylindrical form, somewhat resembling the smoke of a large fire. So like was it that it completely deceived a kite, which, flying towards it, rose up to hover over the supposed smoke, in order to pounce on vermin, started by the fire which it inferred was beneath. This bird never made a greater mistake in its life, for the upward revolving current of air caught it, and with wings outspread, apparently unable to escape, upwards it went with great rapidity. Feeling deeply interested in its fate, I watched it until it became a mere speck, and then faded completely out of sight in the grasp of the whirlwind."*

Mr. COBB stated, in confirmation of the remarks of the previous speaker, that he had seen the masts of a small junk torn out by a whirlwind, raised by its action and apparently thrown out by the centrifugal force at a much higher level, all of which was occurring under a cloudless sky.

Mr. SCOTT communicated the following newspaper extracts:—

CURIOUS PHENOMENON DURING THE GALE.—Mr. M. Michelski writes, under date October 12th, 1877:—"May I be allowed a little space in your valuable paper to state what I witnessed last night during the gale, and what remains to me yet, notwithstanding my inquiries, an unexplained phenomenon. I write this

* Canoe and Camp Life in British Guiana, by C. Barrington Brown, Assoc. R.S.M. P. 267.

in the hope of eliciting an explanation. I may premise that our house is situate about 150 yards from Wandsworth Common. After being awakened last night towards one or two o'clock by the noise of the wind, I was watching from my bed the motion of the trees near our bedroom window, when a sudden spark of light seemed to flash quite close past the window, almost grazing the panes of glass. The same phenomenon having repeated itself a few minutes after, I got up in the fear lest it might proceed from a fire, but I could detect no trace of such. As I was still watching from the window the effects of the hurricane outside, and on the point of retiring, I perceived distinctly on the road, 15 yards in front of me, a ball of fire rolling along, carried, as it were, before the wind, and disappearing among the trees. I felt thoroughly puzzled, and after a few minutes returned to bed, but did not go to sleep without noticing the passage of two more of these mysterious lights. On inquiring to-day I have ascertained that these same strange lights have been perceived by many people not only in the immediate vicinity, but on Clapham Common, and down about Battersea, an area of two to three miles, which seems to exclude the theory of these lights being sparks from a house fire, or the like. Might they not rather be a meteoric fall, or possibly electric sparks?"—*London Daily Papers.*

SINGULAR PHENOMENON AT LOWER CUMBER.—A singular phenomenon was witnessed here on Wednesday night last, about eleven o'clock. A large fir tree, growing at the gate of the church avenue, appeared all dotted over with twinkling little stars, of a whitish-blue colour, whose rays shed a faint light for some distance around, and filled the surrounding atmosphere with an oppressive and disagreeable odour. These atoms of light in a short time united into a globe of fire at the top of the tree, of a brilliant green, and immediately rose into the air, wafted slowly by a slight breeze—leaving a trail of luminous matter behind it—towards the church tower, against which it struck, smashing the ball into atoms. A few very large drops of rain at this juncture fell, accompanied by a brilliant flash of lightning, and followed by a terrific peal of thunder, when the glittering sparks evaporated.—*Londonderry Sentinel, June* 1, 1878.

The following Papers were read:—

"On the application of Harmonic Analysis to the reduction of Meteorological Observations, and on the General Methods of Meteorology." By the HON. RALPH ABERCROMBY, F.M.S. (p. 141.)

"On some peculiarities in the Migration of Birds in the Autumn and Winter of 1877-78." By JOHN CORDEAUX. (p. 157.)

The Meeting was then adjourned.

Donations received from April 1st to June 30th, 1878.

Presented by Societies, Institutions, &c.

Bath	Natural History and Antiquarian Field Club ..	Proceedings. Vol. IV. No. 1.
Brisbane.....	General Registry Office..	Report on the Vital Statistics, January to March.
Brussels	Observatoire Royal.....	Bulletin Météorologique.
	,, ,,	Annales, July and August, 1877.
	,, ,,	Annales Météorologiques, January and February.
	,, ,,	Observations Météorologiques faites aux stations internationales de la Belgique et des Pays Bas, December, 1877, and January, 1878.
	Société Belge de Géographie	Bulletin, Vol. II. Nos. 1-2.
Calcutta	Meteorological Office	The Indian Meteorologist's Vade Mecum. Parts I.-II. By H. F. Blanford.
	,, ,,	Tables for the reduction of Meteorological Observations in India. By H. F. Blanford.
Carlsruhe	Meteorologischen Centralstation	IX. Jahresbericht.
Copenhagen ..	Danske Meteorologiske Institut	Annuaire Météorologique. 1876, Part II.: 1877, Part I.
	,, ,,	Bulletin Météorologique du Nord, March 1 to May 31.
Cracow	K. K. Sternwarte.....	Meteorologische Beobachtungen, February to May.
Edinburgh	Scottish Meteorological Society	Journal, Nos. LI. to LIV.
Fiume.....	I. R. Accademia di Marina	Meteorological Observations, January to April.
Geneva	Société de Géographie ..	Le Globe. Tome XVI. Livraison 4; XVII. II., 1.
Greenwich	Royal Observatory	Report of the Astronomer Royal to the Board of Visitors, June 1.
Hamburg	Deutsche Seewarte.....	Wetterbericht.
	,, ,,	Monatliche Uebersicht der Witterung, December, 1876; November and December, 1877.
Iowa	Weather Service	Weather Bulletin, Vol. I. No. 1.
Leipzig	Sternwarte	Meteorologische Beobachtungen in Deutschland, 1876.
Lisbon	Observatorio do Infante D. Luiz	Annaes. Vol. XIII., 1875.
	,, ,,	Resumo das Principaes Observaçoes Meteorologicas executadas durante o Periodo de 20 Annos decorridos desde 1856-1875.
	,, ,,	Postos Meteorologicos. 1875, Parts I. and II.
London	General Register Office ..	Weekly Return of Births and Deaths, Nos. 13-25.
	,, ,,	Quarterly Return of Marriages, Births and Deaths, March 31st.
	India Office	The Meteorology of the Bombay Presidency. By C. Chambers, F.R.S. Letter-press, Diagrams and Maps.
	Meteorological Office	Daily Weather Reports.

ın	Meteorological Office	Weekly Weather Report, Nos. 1-19.
	,, ,,	Hourly Readings, June to September, 1877.
	,, ,,	Meteorological Observations at Stations of the Second Order, 1876. Part II.
	,, ,,	Annuaire du Bureau des Longitudes pour l'an 1878.
	,, ,,	Annales de l'Observatoire Royal de Bruxelles, Tomes XXI. et XXII.
	Royal Astronomical Society	Monthly Notices. Vol. XXXVIII. Nos. 5-7.
	Royal Institution.....	Proceedings, No. 68.
	Royal Society	Proceedings, Nos. 186 and 187.
	Science and Art Department	Conferences held in connection with the Special Loan Collection of Scientific Apparatus, 1876. Two Vols.
	Society of Arts	Journal, Nos. 1323-1336.
	Society of Public Analysts	The Analyst, Nos. 25-27.
ı	Commission de Météorologie	Rapport, 1876.
d	Sociedad Geográfica	Boletin. Tomo II. No. 6; III., 5 and 6; IV., 1.
urne	Observatory	Monthly Record of Results of Observations in Meteorology, Terrestrial Magnetism, &c., November 1877.
o	Ministero de Fomento ..	Boletin, Nos. 12-27, 45-54.
	,, ,,	Mexican Contributions to the Bulletin of International Meteorological Observations, February.
na	Società Meteorologica Italiana	Annuario. Vol. I. Nos. 1-14.
alieri	Osservatorio del R. Collegio Carlo Alberto	Bullettino Meteorologico, 1877, Nos. 5-9.
	,, ,,	Osservazioni Meteorologiche, February to April.
	,, ,,	Il Padre Angelo Secchi. Commemorazione del P. F. Denza.
York	Central Park Observatory	The City Record, No. 1440.
	,, ,,	Abstract of Registers from Self-Recording Instruments, March and April.
.....	Exposition Universelle ..	La Nouvelle Société Indo-Chinoise fondée par M. Le Marquis de Croizier et son ouvrage L'Art Khmer. Par le Dr. Legrand.
	Observatoire de Montsouris	Bulletin Mensuel, No. 73.
	Observatoire National ..	Bulletin International.
delphia ..	American Philosophical Society	Proceedings, No. 100.
	,, ,,	List of Surviving Members, January 18th, 1878.
ıe	K. K. Sternwarte	Astronomische, magnetische, und meteorologische, Beobachtungen im Jahre 1877.
ı	Osservatorio del Collegio Romano	Bullettino Meteorologico, October, 1877, to January, 1878.
	,, ,,	In Memoriam, P. A. Secchi.
	Ministero della Pubblica Instruzione	Bollettino Mensile, October and November, 1877; January, 1878.
'etersburg.	Physikalische Central-Observatoriums	Annalen, 1876.
;y.....	Government Observatory.	Meteorological Observations, June, 1877.
.....	Physikalische Observatorium	Materialen zu einer Klimatologie des Kaukasus, January, 1876, to April, 1878.
ıto	Magnetic Observatory ..	Monthly Meteorological Register, January 1 to December 31, 1877.
	,, ,,	General Meteorological Register, 1877.
a	Observatoire de l'Université.....	Bulletin Météorologique Mensuel, June to October, 1877.

Vienna.....	K. K. Centralanstalt für Meteorologie und Erdmagnetismus	Beobachtungen. February to April.
	Oesterreichische Gesellschaft für Meteorologie.	Zeitschrift. Nos. 7-13.
Washington. ..	War Department.....	Monthly Weather Review, February to April.
	,, ,,	Daily Bulletin of Weather Reports, with the Synopses, Probabilities, and Facts, October, 1874.
Watford	Natural History Society	Transactions. Vol. I. Part 9.

Presented by Individuals.

Atkinson, A.	Rainfall at Gainford, County Durham, 1868-1877.
Beaufort, W. M., F.R.A.S.	Meteorological Register kept in India, 1860-1863. (MS.
Blomefield, Rev. L., M.A.	Gales of Wind.
Carl, Dr. P.	Windstärkemesser mit Robinson'schen Halbkugelschalen nebst elektrischen Registrirapparat. Construirt von P. Schultze.
Chapman, T. A., M.D.....	Report of the Rainfall in Herefordshire in 1877.
Dunlop, W. H.	Results of Meteorological Observations made at Annan hill, Kilmarnock, in March.
Edlund, Prof. E.	Recherches sur l'Induction unipolaire, l'Electricité atmosphérique et l'Aurore Boréale.
George, Capt. C., F.R.A.S.	Description of a Mercurial Barometer for the use of Travellers, filled by the Spiral-Cord Method.
Greaves, C., F.G.S.	Meteorological Essays. By F. Arago.
,, ...	A Treatise on the Action of the Inertiæ in the Ocean By W. L. Jordan.
,, ...	Appendix to Howard's Barometrographia. Part I.
,, ...	Annuaire du Bureau des Longitudes pour l'an 1875.
,, ...	Transactions of the Meteorological Society of Mauritius Vol. III.
Hankinson, R. C.	The Weather at Red Lodge, Southampton. March to May. (MS.)
Hann, Dr. J.	Ueber die Temperatur von Wien nach 100 jährigen Beobachtungen.
,, ...	Ueber den Luftdruck zu Wien mit einen Nachtrag über die Temperatur zu Wien.
Harding, C.	Memorandum on the diurnal Variation of Atmospheric Pressure at the Sandheads.
Hildebrandsson, H. H. ..	Sur les Observations des nuages. Lettre au Comité permanent international de météorologie.
Hopkinson, J., F.L.S.	Report on the Rainfall in Hertfordshire, 1876.
,, ...	Meteorological Observations, Watford, for the year ending February 28, 1877.
Hoskins, S. E., M.D., F.R.S.	Meteorological Observations, Guernsey, March to May.
Jinman, G.	Winds and their Courses. Third Edition.
Krümmel, Dr. O.	Die Vertheilung der Regen in Europa.
Loomis, Prof. E.	Results derived from the Observations of the U.S. Signal Service. Ninth Paper.
Mackereth, T., F.R.A.S. ..	Tenth Annual Report of the Salford Meteorological Observatory, 1877.
Mansuy, E.	Aperçus nouveaux sur les Causes et les Lois des Trombes et des Tempêtes; extraites des Voyages de M. Seaman et traduis par E. Mansuy.
Nicol, J., M.D.	Llandudno as a Health Resort.
Ormerod, Miss E. A.	Pre-Instrumental Meteorology, contained in extracts from the Saxon Chronicle and Holinshed's Chronicles of England, Scotland and Ireland. (MS.)
Preston, Rev. T. A., M.A.	Wiltshire Rainfall, January to April.
Redford, Rev. F., M.A., F.R.S.E.	Results of Meteorological Observations, Silloth, May 12-18.
Sabine, General Sir E., F.R.S.	Contributions to Terrestrial Magnetism. No. XV.

Silver, S. W.	The Colonies and India. Nos. 293-305.
Symons, G. J., F.R.S.	Symons's Monthly Meteorological Magazine, April to June.
,, ...	British Rainfall, 1877.
Tennent, R., F.R.S.E.	Proposed Theory of the Progressive Movement of Barometric Depressions or Storms.
The Editor	Academy. Nos. 309-321.
,, ...	Nature. Nos. 440-452.
,, ...	Sanitary Record. Nos. 197-209.
,, ...	Telegraphic Journal and Electrical Review. Nos. 124-129.
Whitmore, J., M.D.	Health and Meteorology of Marylebone, April.
Woeikoff, Dr. A.	Mémoire Explicatif pour les Cartes et Diagrammes de A. Woeikoff à l'Exposition Universelle.
Zenger, Prof. K. W.	Ueber den Ursprung und die Periode der Stürme.

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VIII. *Contributions to the Meteorology of Natal—Observations taken at Maritzburg.* By ROBERT JAMES MANN, M.D., F.R.C.S., F.R.A.S. (Communicated by the Meteorological Council.)

[Received May 9th.—Read June 19th, 1878.]

THE following tables contain the results of observations made at Maritzburg, the capital of the colony of Natal, during the years 1860-5. Observations for the two previous years (1858-9) were printed *in extenso* in the "Fifth Number of Meteorological Papers, published by authority of the Board of Trade" (1861). The observations for those two years have not, however, been included in the following tables, because a change was made in the position of the observatory (in March, 1859) to about five miles to the westward, rendering the observations for the two periods not strictly comparable. Abstracts, especially relating to temperature and rainfall of these periods, have also appeared in the "Proceedings" of the Society.

The observatory was situated in lat. 29° 30′ S, and long. 30° 2′ E, at an elevation of 2,095 feet above the level of the sea, and distant in a direct line about 40 miles from it. This elevation was determined by 90 simultaneous observations made with the standard barometer in the observatory, and with a marine barometer of Casella's, furnished by the Meteorological Department of the Board of Trade, and kept at the Custom-house at the port, established 6 feet above the average high tide. The two barometers were carefully compared by means of a very excellent mountain barometer.

The observations were taken at the hours of 9 a.m., 3 p.m., and 9 p.m., local time. The standard barometer (Negretti, No. 318) was examined by Mr. Glaisher, between May 13 and June 30, 1857, and certified as having

a correction for index error of + 0·014 in., and for capillarity + 0·013 in. These corrections, and that for reduction to temperature of 32° have been applied, but the observations have not been reduced to sea level.

The thermometers employed were a maximum by Negretti and Zambra, and a spirit minimum of the Rutherford-Negretti pattern. Both were compared by Mr. Glaisher, and the corrections ascertained. The ordinary thermometers were supplied by the Meteorological Department of the Board of Trade, and had Kew certificates. The errors were insignificant, and corrections were not applied, being, in both instances, within the tenth of a degree. The thermometers were placed 7 feet above the ground on the wall of the house under a broad verandah, and only exposed to the cool SE quarter, sheltered from the hot NW and well isolated from the wall. This situation was adopted on account of the impossibility of getting regular readings in the open during the storm season. Careful comparisons of temperatures were however made, which left no shadow of doubt that during the hot season the verandah temperatures were the best air temperatures. The heat at this time is so great, that all small structures in the sunshine, such as ordinary stands, get heated through and through, and retain very great radiating power. The monthly means of air-temperature have been obtained by a combination of the means for 9 a.m., 3 p.m., 9 p.m., with the mean of the minimum, as a comparison of other inter-tropical observations, has shown that this combination gives a result as nearly as possible equal to the true mean obtained from 24-hourly observations.

The funnel of the rain-gauge was 6 inches square, and was 6 feet above the ground, on an isolated pillar in an open space; there being no buildings near, and the trees within range all round being kept down to a very low elevation, which in no instance involved an angle of 25° with the horizon.

The wind direction was recorded by true bearings, and the force estimated by Beaufort's scale (0-12).

The following general remarks on the climate of Natal, at the elevation of 2,000 feet above the sea, are based upon the observations which are summarised in these tables, and will probably be deemed a suitable introduction to them.

The colony of Natal is not very far removed from the tropical latitudes in which the southern trade-wind prevails; that is, it is just outside the region where there is a constant and steady movement of the air from the south-east towards the north-west. The general range of the sea coast,—from SW to NE,—is also immediately across this direction of the southern trade. The consequence is, since the land gets more rapidly heated by the sunshine in the day than the water, that a very strong tendency to the production of a sea-breeze is established during the day. But such a breeze is also from the SE, that is, it lies in the same general direction as the current of the trade-wind.

The great geographical inclination in the atmosphere to flow toward the north-west, which is hardly lost in the latitudes of Natal, is thus renewed, and reinforced by a powerful secondary natural agency; and the sea-breeze,

as a matter of fact, predominates over the land breeze in a very remarkable degree.

The observations made at Maritzburg showed that even at that distance inland, the air moves from the sea inward over the land six times more frequently than it moves outward from the land towards the sea. This very remarkable prevalence of the sea-breeze determines the character of the climate of the colony, and fixes the laws of its rainfall and temperature. As a matter of course, more vapour is raised from the sea into the in-drifting mass of the sea-breeze in the hot season of the year than in the cold, and accordingly there is more water in the air to be shed upon the slopes of the land in that hot season, than there is at the opposite period of the year. The summer of Natal is for this reason a season of copious rain, and the winter a season of relative dryness, and on the same account, the summer is a time of abundant and frequent cloud, and the winter a time of preponderant sunshine. The summer is consequently cooler in a material degree than it would otherwise be, on account of the frequent prevalance of cloud and the abundance of the rainfall; and the winter has its temperature materially raised, from the constant occurrence of clear skies and bright sunshine. The mean annual rainfall at Maritzburg for the six years, 1860-5, was 31·13 in. Of this amount nearly 28 in. came down during the six summer months of the year (October to March), and scarcely more than 2 in. during the four winter months (May to August). During each of the two intermediate months of April and September, 1·5 in. fell. The average fall of rain for each month of the year, shown by the period of six years' observations under discussion, was :—

Month.	In.	Month.	In.
January	4·189	July	0·165
February	4·992	August	0·757
March	3·256	September	1·507
April	1·552	October	3·529
May.	1·114	November	4·652
June	0·251	December	5·170

The largest monthly fall in this period was in the month of November, 1860, and amounted to 8·951 in.

The greatest rainfall that occurred in any of the twelve months of the year was :—

Month.	Year.	In.	Month.	Year.	In.
January	1865	6·910	July	1863	0·747
February	1864	7·590	August	1860	1·342
March	1864	5·040	September	1860	3·087
April	1861	2·024	October	1863	7·216
May	1863	2·945	November	1860	8·951
June	1865	1·280	December	1864	6·235

The actual rainfall for each year of the series concerned in these observations was :—

Year.	In.	Year.	In.
1860	30·551	1863	34·659
1861	22·613	1864	37·340
1862	30·022	1865	31·610

In this series of years, the difference between the greatest and the least yearly falls was 14·727 in.; the wettest, 1864, being 20 per cent. above the average; and the driest, 1861, 27 per cent. below it.

The exact number of days on which rain fell, reduced to, and estimated as an average, were :

Month.	No. of Days.	Month.	No. of Days.
January	16	July	2
February	16	August	5
March	14	September	10
April	10	October	16
May	4	November	17
June	1	December	19

The general process of the rainfall in the wet season is, that a series of three, four, or five wet days occur, and that these alternate with a series of as many dry days. The rainfall on the *coast* is, on the whole, *heavier* than the rainfall on the hills at the height of Maritzburg (2095 feet above the level of the sea), instead of the reverse, as is so commonly the case in England. There are two obvious reasons in Natal for this peculiarity—in the first place, more rain as a rule falls on the coast than on the uplands during the dry season of the year. But, in addition to this, every now and then heavy sea-storms occur, which deluge the coast with a down-pour that exhausts its chief force in its first burst on the land, and then grows rapidly less as it drifts inwards up the land slope.

In fact, rainfall is caused in Natal by two essentially distinct influences. First, by the development of storms, more or less of the character of thunderstorms, which most powerfully affect the inland districts and the uplands; and, secondly, by the occurrence of sea gales, which fall with most violence upon the coast, and the lands in the close neighbourhood of the sea.

The mean number of thunderstorms for each month of the six years' series was :—

January	8·7	July	0·5
February	7·0	August	1·2
March	6·7	September	4·0
April	5·0	October	8·0
May	1·8	November	6·8
June	0·2	December	9·5

The chances thus are that no thunderstorm will be experienced at Maritzburg during the months of June and July; but that in each of the months of the wet season, extending from October to March, something more than seven thunderstorm days may be looked for, or, in other words, that a thunderstorm may be expected on the average every fourth day. As an actual fact, however, storms generally occur on successive days together, and then leave several days free. In the month of October, it sometimes happens that storms occur for six and even seven days in succession.

The greatest number of thunderstorms that occurred at Maritzburg in each month, for this period, was:—

Month.	Year.	No.	Month.	Year.	No.
January	1861	11	July	1860, 1863, 1864	1
February	1863	11	August	1860, 1862	2
March	1860	9	September	1865	10
April	1862	7	October	1864	14
May	1862	6	November	1863	10
June	1864	1	December	1863	14

The sea-gale rainfalls in Natal are almost invariably associated with a high barometric column, whilst the thunderstorm rains are as commonly connected with a low barometer. The reason for this is, however, perfectly obvious. The sea-gales occur with a very strong and very strenuously maintained southerly wind, which, like the northern wind of the opposite hemisphere, means a cold, condensed, and therefore relatively heavy, state of the atmosphere. The thunderstorms, on the other hand, immediately follow the periods of largest rarefaction from heat, which are connected with a relatively light state of the atmosphere. If the movements of the column of the barometer from day to day are traced down upon paper as a series of successive "waves," it is almost invariably found that sea gales correspond to the crest of these waves, and thunderstorm rains to the hollows of depression which lie between the crests; or, perhaps, more exactly to the points where the wave just begins again to rise after the lowest dip of the trough.

There is an almost constant *diurnal* oscillation of the mercurial column of the barometer, amounting on an average to 0·078 in. It is seen distinctly on thirteen days out of fourteen, and the exceptional days are simply those in which the barometer is rising so rapidly under a larger and more general influence, that the diurnal oscillation is more than compensated by it, and in that way masked.

But, apart from these diurnal fluctuations, it may be further affirmed that the mercurial column is never stationary in Natal. It is continually moving boldly up or boldly down from day to day.

These larger oscillations are brought about by the bodily and progressive transference of masses of air from place to place. The upper and lower strata of the air flow in antagonistic currents, but of these two currents the

lower comes from a cold zone of the earth and is comparatively heavy a dense, while the upper comes from a warm zone of the earth and comparatively light and rare. When these two currents are at a norm or average relation to each other, the barometer shows a certain average mean indication of pressure. But if this medium condition is disturbed— one current encroaches unduly upon the other—the indication of t barometer is changed in a corresponding degree. When the upp north-west current encroaches on the lower, the column of mercury in t barometer goes down. When the lower south-east current encroaches up the upper, the column of mercury rises.

Whenever the predominance of the north-west upper current prevails Natal to the extreme degree, so that it actually reaches the surface of t ground and for the time displaces the lower south-easterly current, it is f as a dry hot wind which parches everything it touches. This hot land-win when it occurs, is strong. Most commonly it is very strong, amounti almost to a hurricane. It is always irregular and fitful, expending itself short bursts and gusts, and sweeping dense clouds of dust over the count as it continues. The hot wind blows most frequently in the months August, September, October, and November, and therefore it is, in so degree, ruled by the march of the season.

The following table gives the mean, 9 a.m., 3 p.m., 9 p.m., and the highe and the lowest readings of the standard barometer at Maritzburg, for each ye of the series:—

Years.	Mean of 9 a.m. and 3 p.m.	9 a.m.	3 p.m.	9 p.m.	Highest.	Lowest.
	In.	In.	In.	In.	In.	In.
1860	27·908	27·945	27·870	27·948	28·393	27·429
1861	·909	·947	·870	·952	·393	·392
1862	·860	·900	·819	·902	·401	·419
1863	·899	·936	·862	·947	·362	·369
1864	·917	·955	·879	·954	·423	·470
1865	27·922	27·959	27·884	27·962	28·431	27·342

The mean pressure of the atmosphere during the six years was 27·903 i The highest reading during the period was 28·431 in.; the lowest readi 27·342 in. The extreme range during the six years was, therefore, 1·0 in.

The thermometer very ely rises above 85° in the shade in Natal, ev in the midst of th eason, unless a hot wind is blowing. It th mounts to 5° and 97°, according to the strength of t est hurricane occasionally prevails with ut this is rare. The amount of humid mometers, when a hot wind is blowi oisture. But on rare occasions, it

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June currents the

so great that the ordinary tables employed in reducing the observations of the dry and wet bulbs do not suffice to give the indication required.

The highest, lowest and mean temperatures in each year were:—

Year.	Highest.	Lowest.	Mean.	Year.	Highest.	Lowest.	Mean.
	°	°	°		°	°	°
1860	97·1	31·4	62·9	1863	94·6	35·2	63·3
1861	95·4	29·0	62·9	1864	94·8	29·8	63·3
1862	95·2	32·0	63·1	1865	97·6	34·8	64·2

The average maximum, minimum and mean temperatures for each month of the year were:—

Month.	Average Max.	Average Min.	Mean Temp.
	°	°	°
January	78·8	64·7	70·5
February	78·3	64·8	70·3
March	77·3	62·4	68·7
April	73·1	57·0	63·8
May	69·7	48·7	57·7
June	66·7	43·0	52·8
July	68·4	44·1	54·4
August	71·1	49·0	58·6
September	74·0	55·2	62·9
October	74·4	58·7	65·1
November	74·2	59·3	65·4
December	77·6	63·5	69·2

The highest air-temperature recorded during this six-year period was 97°·6. This occurred during a hot wind on December 30th, 1865. The lowest temperature was 29°. The extreme range in six years was therefore 68°·6. The mean temperature derived from this series was 63°·3.

The air-temperature in Natal is subject to frequent and sudden vicissitudes, and these are more marked at Maritzburg and amongst the hills than they are in the lower coast region. The great changes of temperature also occur principally between one day and the next, in the summer season; but between successive days and nights in the winter season. The mean temperature of the day jumps fitfully up and down during the season of summer. The mean temperature of the day, on the other hand, moves evenly along in the winter season, but there is then considerable difference between the temperature of day and night, and the daily range of temperature is accordingly large. The reason for this remarkable and interesting peculiarity is the frequent intervention of the cooling influence of dense cloud and rain in the season of summer, and the almost uninterrupted presence of clear skies in winter, allowing the full influence of sunshine to tell upon the ground by day, and the full power of radiation to come into play between sunset and sunrise.

Abstract of Meteorological Observations taken at Maritzburg, Natal, during 1869.

Months.	Barometer.				Air Temperature.										Dew Point.				Relative Humidity.			
	9 a.m	3 p.m.	9 p.m.	Mean 9 a.m. and 3 p.m.	9 a.m.	3 p.m.	9 p.m.	Mean 9, 3, 9 and Min.	Means of Min.	Means of Max.	Absolute Min.	Date.	Absolute Max.	Date.	9 a.m.	3 p.m.	9 p.m.	Mean 9—9.	9 a.m.	3 p.m.	9 p.m.	Mean 9—9.
	In.	In.	In.	In.	°	°	°	°	°	°	°		°		°	°	°	°	o/o	o/o	o/o	o/o
January ..	27·859	27·805	27·863	27·832	72·4	75·5	67·9	69·8	63·3	78·7	56·4	11	92·6	4	62·0	62·3	62·9	62·5	70·6	64·4	84·3	77·5
February ..	·830	·751	·826	·791	74·7	79·6	70·6	72·7	66·0	82·0	61·8	8, 19	**97·1**	**6**	64·2	63·7	64·7	64·5	70·8	59·7	81·9	76·4
March	27·858	·785	27·862	27·822	71·5	77·8	68·0	70·1	63·0	80·3	53·2	23	92·8	30	60·5	60·2	61·9	61·2	69·1	56·1	81·1	75·1
April	28·039	·963	28·060	28·001	64·1	70·8	61·2	63·1	56·4	73·5	49·0	15	86·2	23	54·9	53·7	56·1	55·5	72·5	56·7	83·7	78·1
May	27·977	·886	27·963	27·932	58·3	69·9	56·5	58·4	48·7	71·7	41·2	19	82·4	29	48·6	48·8	48·8	48·7	71·0	48·8	76·3	73·7
June	28·065	·981	28·047	28·023	52·2	68·0	51·1	53·6	43·0	69·5	35·6	21	77·0	30	41·7	43·3	42·3	42·0	68·6	42·4	72·4	70·5
July	·037	27·948	·034	27·993	51·5	66·3	51·5	52·7	41·3	67·8	**31·4**	**8**	75·8	21, 30	41·2	41·7	42·7	42·0	69·0	42·4	72·8	70·9
August	28·115	28·028	28·101	28·072	58·9	68·6	57·1	58·5	49·2	70·7	38·6	16	79·8	5	47·2	46·6	48·8	48·0	66·5	48·3	74·6	70·6
September	27·879	27·793	27·873	27·836	62·1	68·7	59·3	61·1	54·2	71·1	42·6	5	90·2	7	51·5	52·6	52·7	52·1	70·7	60·1	80·2	75·5
October	·929	·852	·935	·891	66·6	69·8	62·8	64·4	58·5	73·2	50·2	9	87·2	13	57·3	59·5	57·6	57·5	73·0	70·9	84·0	78·5
November	·883	·826	·912	·855	66·1	67·0	60·9	63·0	57·9	70·9	45·6	5	84·4	16, 20	57·0	57·6	56·6	56·8	73·7	73·6	86·4	80·1
December	27·870	27·817	27·902	27·844	70·1	70·8	64·8	66·9	61·7	74·8	57·0	6	89·2	14	61·4	61·8	60·3	60·9	74·9	74·0	86·1	80·5
Year ..	27·945	27·870	27·948	27·908	64·0	71·1	61·0	62·9	55·3	73·7	..	..	..	..	54·0	54·3	54·6	54·3	70·9	58·1	80·3	75·6

Months.	Amount of Cloud.				Rainfall.			Weather, No. of days of							Wind, No. of Observations, at 9 a.m., 3 p.m., and 9 p.m.								
	9 a.m.	3 p.m.	9 p.m.	Mean 9—9	Total.	Max.	Date.	Rain.	Hail.	Thunder-storms.	Clear Sky.	Overcast.	Gales.	Hot Winds.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					In.	In																	
January	6·0	6·6	8·0	7·0	2·302	0·262	8	20	0	10	2	14	0	1	7	6	28	30	14	1	4	2	1
February	5·3	5·4	8·3	6·8	4·189	1·429	17	13	0	9	3	7	1	3	6	10	22	26	10	1	3	7	2
March	3·9	4·7	7·1	5·5	0·829	0·273	10	8	0	9	4	8	0	0	8	7	27	19	17	3	4	3	5
April	4·0	4·2	7·1	5·6	1·675	0·415	25	9	0	6	7	7	1	0	6	6	21	30	15	5	3	2	2
May	2·2	2·5	2·5	2·4	0·393	0·349	27	2	0	1	16	3	1	3	5	13	29	11	12	9	8	5	1
June	1·0	1·0	2 7	1·9	0·065	0·033	26, 27	2	0	0	24	1	1	0	6	11	25	10	21	13	4	0	0
July	1·0	1·2	2·0	1·5	0·044	0·033	23	2	0	1	21	1	1	0	1	3	23	17	28	14	7	0	0
August	3·3	3·7	4·3	3·8	1·342	1·189	31	5	0	2	14	5	1	0	5	8	21	21	22	7	4	3	2
September ..	5·1	5·7	6·0	5·6	3·087	0·905	25	18	0	5	8	10	5	3	2	3	25	28	14	7	3	7	1
October	5·1	6·2	8·0	6·6	3·545	0·873	21	14	0	6	2	10	1	4	7	6	32	25	13	2	5	3	0
November ..	6·1	8 0	8·0	7·2	8·951	**1·636**	**27**	22	0	8	4	17	1	1	4	2	30	24	23	3	1	3	0

Months.	Barometer.				Air Temperature.										Dew Point.				Relative Humidity.			
	9 a.m.	3 p.m.	9 p.m.	Mean 9 a.m. and 3 p.m.	9 a.m.	3 p.m.	9 p.m.	Mean 9, 3, 9 and Min.	Means of		Absolute Min. and Max.				9 a.m.	3 p.m.	9 p.m.	Mean 9—9	9 a.m.	3 p.m.	9 p.m.	Mean 9—9
									Min.	Max.	Min.	Date.	Max.	Date.								
	In.	In.	In.	In.	°	°	°	°	°	°	°		°		°	°	°	°	o/o	o/o	o/o	o/o
January ..	27·830	27·768	27·842	27·799	72·8	75·5	68·0	70·1	64·0	78·7	51·8	18	89·2	6	61·8	62·2	62·7	62·3	67·5	64·5	83·8	75·7
February ..	·898	·839	·915	·869	68·5	71·8	65·0	66·7	61·5	74·3	55·8	20	84·2	3	60·1	61·8	60·8	60·5	74·7	71·7	86·8	80·8
March	·904	·821	·911	·863	68·1	74·1	65·3	66·8	59·6	76·2	48·8	18	87·2	12	59·5	60·7	61·1	60·3	74·5	64·1	86·4	80·5
April	·946	·870	·949	·908	65·2	72·5	62·8	64·3	56·5	74·3	45·2	27	89·5	3	56·9	57·6	58·1	57·5	75·5	60·8	84·8	80·2
May	27·923	·866	27·927	27·895	58·0	67·4	56·4	57·6	48·5	69·8	36·4	27	78·8	2	49·6	51·2	50·6	50·1	74·5	57·3	81·7	78·1
June	28·059	27·967	28·042	28·013	53·5	66·9	51·1	53·6	43·0	68·0	35·0	4, 5	76·0	15	43·2	43·4	43·9	43·6	69·1	44·2	77·1	73·1
July	·110	28·012	·088	·061	52·3	66·6	51·2	52·9	41·3	67·7	**29·0**	**10**	80·8	30	40·6	40·1	41·9	41·3	65·8	39·1	71·6	68·8
August	28·119	28·030	28·108	28·075	59·1	70·1	56·7	58·8	49·1	71·9	35·0	12	81·6	22	46·5	47·1	48·9	47·7	64·8	45·5	76·0	70·4
September	27·935	27·837	27·937	27·886	67·9	75·7	63·9	66·3	57·7	78·6	50·0	29	**95·4**	**27**	51·9	51·2	53·1	52·5	58·7	45·2	70·0	64·4
October ..	·967	·893	·986	·930	66·2	69·4	62·6	64·1	58·2	72·3	47·0	17	93·0	30	54·9	55·2	56·1	55·5	69·2	64·0	80·4	74·8
November..	·874	·787	·891	·831	68·0	71·6	63·1	65·5	59·4	74·6	52·0	15	93·4	23	56·2	57·7	56·8	56·5	67·8	63·4	80·8	74·3
December	27·802	27·752	27·824	27·777	71·4	73·3	66·4	68·4	62·6	77·1	54·4	12	93·0	29	60·6	62·5	61·9	61·3	69·8	70·6	85·8	77·8
Year	27·947	27·870	27·952	27·909	64·3	71·2	61·0	62·9	55·1	73·6	..	..	..	..	53·5	54·2	54·7	54·1	69·3	57·5	80·4	74·9

Months.	Amount of Cloud.				Rainfall.			Weather, No. of days of							Wind, No. of Observations, at 9 a.m., 3 p.m., and 9 p.m.								
	9 a.m.	3 p.m.	9 p.m.	Mean 9—9	Total.	Max.	Date.	Rain.	Hail.	Thunder-storms.	Clear Sky.	Overcast.	Gales.	Hot Winds.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					In.	In.																	
January	5·1	7·0	7·4	6·3	2·176	0·553	1	10	0	11	2	7	0	0	8	10	31	28	9	3	0	3	1
February	6·9	6·9	7·8	7·4	4·454	**1·015**	**9**	17	0	6	2	14	0	0	4	6	26	32	10	2	0	1	3
March	3·7	4·4	7·0	5·4	2·433	0·780	2	10	0	4	6	5	0	0	5	3	34	29	13	3	2	1	3
April	3·4	4·4	6·7	5·1	2·024	0·725	5	11	0	4	7	5	0	1	4	5	29	21	16	5	7	2	1
May	2·8	3·7	3·5	3·2	0·660	0·355	7	3	0	2	14	5	1	1	10	3	26	21	25	5	3	0	0
June	2·0	1·2	1·6	1·8	0·000	..	..	0	0	0	22	1	0	1	3	7	25	19	18	9	4	4	1
July	2·2	1·6	2·2	2·2	0·049	0·022	7, 11	3	0	0	19	2	1	2	3	8	18	10	19	20	12	3	0
August	2·7	2·1	3·4	3·1	0·087	0·049	8	4	0	1	17	3	1	2	10	7	31	20	13	6	5	1	0
September ..	3·3	3·7	5·5	4·4	0·436	0·240	23	5	0	1	10	7	1	4	12	13	22	20	9	2	3	6	3
October	5·6	6·3	6·8	6·2	3·126	0·529	11	16	0	9	7	14	0	3	3	7	21	22	24	6	4	4	2
November ..	6·0	6·5	8·5	7·3	2·498	0·846	24	15	0	6	2	12	1	3	6	5	29	27	16	3	0	4	0
December	4·6	6·6	7·5	6·1	4·670	0·840	31	18	2	7	6	13	0	0	3	12	35	23	11	6	2	0	1
Year	4·0	4·5	5·7	4·9	22·613	..	..	112	2	50	114	88	5	17	71	86	327	272	183	70	42	29	15

Abstract of Meteorological Observations taken at Maritzburg, Natal, during 1862.

Months.	Barometer.				Air Temperature.										Dew Point.				Relative Humidity.			
	9 a.m.	3 p.m.	9 p.m.	Mean 9 a.m. and 3 p.m.	9 a.m.	3 p.m.	9 p.m.	Mean 9, 3, 9 and Min.	Means of Min.	Means of Max.	Absolute Min.	Absolute Min. Date.	Absolute Max.	Absolute Max. Date.	9 a.m.	3 p.m.	9 p.m.	Mean 9—9	9 a.m.	3 p.m.	9 p.m.	Mean 9—9
	In.	In.	In.	In.	°	°	°	°	°	°	°		°		°	°	°	°	o/o	o/o	o/o	o/o
January ..	27·835	27·771	27·845	27·803	71·2	74·3	67·4	69·2	63·8	76·5	57·4	24	87·4	18	62·8	64·0	63·2	63·0	75·4	71·3	86·7	81·1
February ..	·836	·764	·835	·800	72·5	77·5	69·5	71·3	65·6	79·4	60·0	3	89·0	24	63·6	64·9	64·4	64·0	74·1	66·2	84·4	79·3
March	·908	·839	·920	·874	69·1	74·3	66·3	67·9	62·0	76·1	54·2	28	85·0	9	60·6	61·9	61·8	61·2	75·3	66·0	85·7	80·5
April	·894	·814	27·893	·854	65·3	71·8	62·7	64·2	56·9	73·3	43·6	22	87·2	1	56·2	54·4	57·9	57·1	73·0	55·5	84·5	78·8
May	·999	·920	28·003	·960	58·3	66·8	56·5	57·5	48·5	68·6	39·2	28	76·8	14	51·4	51·2	51·9	51·7	78·7	58·3	84·9	81·8
June	·913	·824	27·900	·869	52·1	64·8	49·9	51·8	40·4	66·8	**32·0**	**11**	75·8	21	40·1	41·1	40·8	40·5	65·8	42·6	72·3	69·1
July	·976	·882	·956	·929	54·6	68·1	53·7	55·4	45·3	69·6	37·0	15	82·2	11	41·1	42·7	42·7	41·9	61·8	41·2	68·1	65·0
August	·974	·878	·973	·926	57·0	67·1	54·4	56·2	46·2	69·1	34·8	1, 20	88·4	9	43·1	45·0	45·1	44·1	61·8	47·0	72·2	67·0
September	·968	·874	·956	·921	63·4	70·7	59·8	62·0	54·1	74·0	41·0	3	**95·2**	**21**	49·4	49·6	50·9	50·2	62·5	50·6	73·8	68·2
October ..	·851	·756	·867	·804	67·2	71·3	62·0	64·6	57·8	75·1	46·2	2	95·0	15	53·9	53·8	55·5	54·7	64·8	57·4	80·4	72·6
November..	·827	·761	·850	·794	68·8	71·4	64·9	66·5	61·0	75·1	55·8	11, 17	89·8	25	59·6	60·2	59·8	59·7	73·4	69·4	84·3	78·9
December ..	27·818	27·749	27·826	27·784	72·4	75·2	68·5	70·2	64·7	78·3	59·0	4	90·2	26	62·7	64·1	63·3	63·0	72·5	70·0	83·9	78·2
Year	27·900	27·819	27·902	27·860	64·3	71·1	61·3	63·1	55·5	73·5	..	..	..	..	53·7	54·4	54·8	54·3	69·9	58·0	80·1	75·0

Months.	Amount of Cloud.				Rainfall.			Weather, No. of days of							Wind, No. of Observations, at 9 a.m., 3 p.m., and 9 p.m.								
	9 a.m.	3 p.m.	9 p.m.	Mean 9—9	Total.	Max.	Date.	Rain.	Hail.	Thunder-storms.	Clear Sky.	Overcast.	Gales.	Hot Winds.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					In.	In.																	
January	6·2	6·8	9·0	7·6	5·313	**2·465**	**29**	17	0	7	1	17	0	1	3	13	24	32	13	5	0	1	2
February	5·3	4·6	7·5	6·4	3·246	1·064	4	11	0	7	6	8	0	1	2	10	23	35	7	2	1	4	0
March	5·3	4·6	8·6	7·0	3·747	1·615	1	15	0	7	2	8	0	0	0	10	32	29	14	5	2	1	0
April	3·1	4·4	6·6	4·9	1·980	1·020	26	10	0	7	8	4	0	1	3	14	28	12	17	8	7	1	0
May	2·1	3·3	3·7	2·9	1·402	0·807	1	7	0	6	16	2	0	3	1	8	30	11	17	17	6	3	0
June	1·0	2·0	1·2	1·1	0·000	..	..	0	0	0	22	1	1	2	3	9	23	8	14	11	18	4	0
July	2·4	2·1	3·1	2·8	0·038	0·038	20	1	0	0	18	5	2	4	4	5	26	10	16	14	12	6	0
August	2·5	3·2	3·8	3·2	1·298	0·611	16	5	0	2	13	4	2	7	5	8	32	13	14	12	2	7	0
September ..	4·6	4·7	5·0	4·8	0·649	0·355	13	3	0	2	7	7	1	8	6	7	22	21	11	16	1	6	0
October	5·0	6·0	6·5	5·8	2·144	0·464	3	15	1	4	8	12	0	8	6	4	25	32	8	4	5	9	0
November ..	6·1	7·2	7·2	6·7	4·058	1·080	9	15	0	7	2	14	0	4	4	7	26	34	10	1	2	5	0

Months.	Barometer.				Air Temperature.										Dew-Point.				Relative Humidity.			
	9 a.m.	3 p.m.	9 p.m.	Mean 9 a.m. and 3 p.m.	9 a.m.	3 p.m.	9 p.m.	Mean 9, 3, 9 and Min.	Means of		Absolute Min. and Max.				9 a.m.	3 p.m.	9 p.m.	Mean 9—9	9 a.m.	3 p.m.	9 p.m.	Mean 9—9
									Min.	Max.	Min.	Date.	Max.	Date.								
	In.	In.	In.	In.	°	°	°	°	°	°	°		°		°	°	°	°	o/o	o/o	o/o	o/o
January ..	27·852	27·801	27·936	27·827	73·0	76·9	69·5	71·3	65·6	79·3	59·0	6	91·4	21	63·6	64·3	64·6	64·1	73·0	66·4	84·8	78·9
February ..	·855	·789	·855	·822	71·6	75·4	68·0	70·0	64·9	77·9	58·0	26, 27	88·4	2	63·6	63·0	63·6	63·6	75·4	67·3	86·4	80·9
March	·844	·780	·858	·812	70·2	75·0	67·9	69·2	63·5	76·9	54·4	2	85·8	4	61·9	63·2	63·4	62·7	76·2	67·9	85·5	80·9
April	27·921	·853	·926	·887	65·9	71·2	63·6	65·0	59·4	73·0	50·0	28	83·0	18	58·9	59·3	59·8	59·4	78·6	67·3	87·6	83·1
May	28·002	·918	27·995	27·960	56·6	65·9	55·1	56·4	47·8	67·3	40·8	12	76·8	1	48·7	49·1	49·2	49·0	75·8	56·1	81·5	78·7
June	·071	·990	28·073	28·031	53·2	65·4	52·4	53·9	44·6	66·9	**35·2**	**18**	73·2	25	45·2	46·5	46·3	45·8	74·8	51·7	80·3	77·6
July	·073	·987	·059	28·030	55·7	65·0	54·5	55·7	47·4	66·4	36·4	30	75·0	24	46·8	48·2	48·2	47·5	73·1	56·0	79·6	76·4
August	28·041	·944	28·024	27·993	57·8	69·6	57·3	58·2	47·9	71·2	36·8	1	81·4	23	47·7	48·1	49·1	48·4	70·2	48·1	75·2	72·7
September	27·950	·865	27·960	·908	62·9	68·3	58·7	60·6	52·5	71·9	38·0	16	92·2	29	49·4	50·6	51·5	50·5	62·8	55·3	77·4	70·1
October ..	·927	·846	·933	·887	66·4	70·2	63·3	64·8	59·4	72·5	49·2	8	84·8	27	58·7	59·8	59·0	58·9	77·1	71·1	86·1	81·6
November..	·857	·784	·875	·821	68·8	69·5	62·8	64·8	58·2	74·6	50·2	22	**94·6**	**4**	56·3	57·9	56·9	56·6	65·6	68·1	82·0	73·8
December ..	27·841	27·786	27·870	27·814	73·0	74·8	67·5	69·6	63·1	78·0	57·2	25	91·2	12	62·5	65·4	62·7	62·6	71·1	73·3	85·0	78·1
Year	27·936	27·862	27·947	27·899	64·6	70·6	61·7	63·3	56·2	73·0	..	..		..	55·3	56·3	56·2	55·8	72·8	62·4	82·6	77·7

Months.	Amount of Cloud.				Rainfall.			Weather, No. of days of							Wind, No. of Observations, at 9 a.m., 3 p.m., and 9 p.m.								
	9 a.m.	3 p.m.	9 p.m.	Mean 9—9	Total.	Max.	Date.	Rain.	Hail.	Thunder-storms.	Clear Sky.	Overcast.	Gales.	Hot Winds.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					In.	In.																	
January	7·4	6·6	8·9	8·2	1·800	0·404	22	14	0	7	0	15	0	2	11	8	29	21	11	4	7	2	0
February	5·6	7·8	9·4	7·5	5·531	1·293	8	23	0	11	1	12	0	0	8	11	19	26	10	6	2	1	1
March	4·5	5·0	7·8	6·2	2·913	0·595	7	14	0	6	3	8	0	0	10	10	30	25	7	7	3	1	0
April	5·3	5·2	6·2	5·8	1·702	0·791	10	13	0	6	4	6	0	0	13	9	16	30	4	11	6	0	1
May	2·4	2·0	4·4	3·4	2·945	1·964	24	4	0	1	14	3	3	1	3	9	15	23	8	20	12	3	0
June	2·2	1·3	3·2	2·7	0·087	0·087	28	1	0	0	16	1	0	0	5	4	17	17	14	17	12	4	0
July	3·5	3·5	4·1	3·8	0·747	0·365	12	5	0	1	11	5	1	4	8	6	16	17	13	13	14	6	0
August	3·2	1·8	3·9	3·6	0·207	0·153	18	3	0	0	16	3	0	2	9	5	28	14	14	13	4	6	0
September ..	3·5	5·2	6·0	4·8	1·756	0·578	19	9	0	4	5	5	2	5	2	8	19	20	17	14	3	7	0
October	3·8	7·0	8·2	6·0	7·216	**2·182**	**23**	18	0	11	3	16	1	2	3	13	22	24	12	4	11	4	0
November ..	5·4	7·4	7·7	6·6	3·755	0·985	25	17	0	10	4	11	0	3	8	12	23	17	15	9	2	4	0
December ..	5·2	7·6	8·6	6·9	6·000	1·715	15	19	0	14	2	14	1	2	6	14	23	26	9	5	6	4	0
Year	4·3	5·0	6·5	5·5	34·659	..	..	140	0	71	79	99	8	21	86	109	257	260	134	123	82	42	2

Abstract of Meteorological Observations taken at Maritzburg, Natal, during 1864.

Months.	Barometer.				Air Temperature.										Dew Point.				Relative Humidity.			
	9 a.m.	3 p.m.	9 p.m.	Mean 9 a.m. and 3 p.m.	9 a.m.	3 p.m.	9 p.m.	Mean 9, 3, 9 and Min.	Means of Min.	Means of Max.	Absolute Min. Min.	Absolute Min. Date.	Absolute Max. Max.	Absolute Max. Date.	9 a.m.	3 p.m.	9 p.m.	Mean 9—9	9 a.m.	3 p.m.	9 p.m.	Mean 9—9
	In.	In.	In.	In.	°	°	°	°	°	°	°		°		°	°	°	°	o/o	o/o	o/o	o/o
January....	27·845	27·784	27·855	27·815	74·0	77·4	69·6	71·6	65·5	80·1	58·2	13	91·6	19	63·3	64·1	64·0	63·7	69·9	65·0	82·8	76·4
February ..	·861	·793	·869	·827	72·0	75·2	69·4	70·7	66·2	76·9	59·0	28	86·5	12	65·2	65·8	65·8	65·5	79·6	73·6	88·4	84·0
March	·916	·842	·916	·879	67·9	71·9	66·2	66·8	61·2	73·9	53·6	18	83·2	3	60·7	62·2	62·1	61·4	78·4	72·5	86·8	82·6
April	27·995	·915	·988	·955	61·3	67·8	59·4	60·6	53·7	69·2	45·2	23	77·2	16	54·3	54·6	55·4	54·9	78·4	66·7	86·7	82·6
May	28·002	·921	27·989	·962	58·5	68·6	57·5	58·8	50·5	70·5	44·0	31	77·8	9	52·4	53·1	53·5	53·0	80·7	58·7	87·2	84·0
June	·035	·945	28·025	27·990	50·7	61·3	52·6	52·4	45·1	63·1	37·8	13	72·2	15	44·0	46·2	45·2	44·6	78·3	58·1	76·5	77·4
July	·070	·977	·060	28·024	51·8	65·3	51·4	52·8	42·5	67·5	**29·8**	**7**	79·2	31	42·3	43·4	44·0	43·2	67·2	46·3	76·5	71·9
August	·050	·963	·034	28·007	59·0	68·2	57·5	58·7	49·9	70·3	38·6	10	82·4	30	46·2	46·0	47·3	46·8	64·1	47·1	70·6	67·4
September	28·010	·927	28·008	27·969	66·4	72·3	61·9	64·3	56·7	76·0	48·8	15	94·2	22	50·5	50·6	52·3	51·4	59·7	50·1	72·4	66·1
October	27·933	·859	27·943	·896	67·3	71·0	63·4	65·2	59·2	74·2	50·6	22	**94·8**	**12**	57·1	58·1	58·5	57·8	71·7	65·9	84·7	78·2
November..	·911	·853	·915	·882	69·2	70·4	64·9	66·3	60·7	74·2	53·0	20	90·6	6	59·3	60·8	59·8	59·6	71·9	73·2	84·9	78·4
December ..	27·833	27·769	27·845	27·801	73·5	75·6	68·8	70·9	65·8	79·4	60·0	4	91·8	15, 22	64·2	65·4	64·1	64·2	73·4	72·2	85·4	79·4
Year	27·955	27·879	27·954	27·917	64·3	70·4	61·9	63·3	56·4	72·9	..	..	..	..	55·0	56·0	56·0	55·5	72·8	62·5	81·9	77·4

Months.	Amount of Cloud.				Rainfall.			Weather, No. of days of							Wind, No. of Observations, at 9 a.m., 3 p.m., and 9 p.m.								
	9 a.m.	3 p.m.	9 p.m.	Mean 9—9	Total.	Max.	Date.	Rain.	Hail.	Thunder-storms.	Clear Sky.	Overcast.	Gales.	Hot Winds.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					In.	In.																	
January	4·8	6·5	8·0	6·4	6·630	1·590	29	16	0	9	5	12	0	3	5	12	26	29	9	3	4	5	0
February	6·7	7·2	8·9	7·8	7·590	**1·890**	**19**	20	0	3	1	15	0	2	4	7	22	23	21	5	2	3	0
March	6·1	6·4	8·7	7·4	5·040	1·245	22	18	0	6	1	12	1	0	2	7	30	26	8	11	9	0	0
April	4·6	3·6	5·2	4·9	0·190	0·105	20	6	0	1	11	8	0	0	3	6	19	17	19	17	7	2	0
May	3·5	3·3	3·8	3·7	0·895	0·550	22	5	0	0	15	4	0	0	1	2	20	18	9	21	21	1	0
June	2·0	2·9	2·5	2·3	0·075	0·075	18	1	0	1	17	2	1	1	1	1	20	15	12	19	20	2	0
July	1·6	2·8	3·5	2·6	0·000	.	.	0	0	1	14	1	0	2	6	7	23	12	16	9	16	4	0
August	4·4	4·4	5·7	5·1	0·340	0·220	16	5	0	1	9	9	1	5	6	5	27	15	15	7	5	13	0
September ..	5·3	6·6	6·0	5·7	0·675	0·240	23	10	0	2	6	12	0	6	9	6	24	26	10	6	3	6	0
October	6·6	7·3	8·3	7·5	4·205	1·230	17	22	0	14	2	16	1	5	6	5	26	30	12	3	1	10	0

Months.	Barometer.				Air Temperature.										Dew Point.				Relative Humidity.			
	9 a.m.	3 p.m.	9 p.m.	Mean 9 a.m. and 3 p.m.	9 a.m.	3 p.m.	9 p.m.	Mean 9, 3, 9 and Min.	Means of Min.	Means of Max.	Absolute Min. Min.	Absolute Min. Date.	Absolute Max. Max.	Absolute Max. Date.	9 a.m.	3 p.m.	9 p.m.	Mean 9—9	9 a.m.	3 p.m.	9 p.m.	Mean 9—9
	In.	In.	In.	In.	°	°	°	°	°	°	°		°		°	°	°	°	o/o	o/o	o/o	o/o
January ..	27·880	27·837	27·906	27·859	73·2	75·8	69·2	71·0	65·8	79·2	56·6	31	86·8	9	64·3	65·9	65·6	65·0	74·6	72·6	88·3	81·5
February ..	·872	·821	·900	·847	73·3	75·4	68·8	70·5	64·5	79·1	58·0	15	93·0	24	63·5	65·0	64·2	63·9	71·8	70·7	85·6	78·7
March	·892	·825	·898	·859	73·0	77·8	69·9	71·4	65·0	80·4	58·6	27	90·2	2	65·0	65·8	66·1	65·6	76·2	67·2	87·5	81·9
April	27·932	·866	27·929	27·899	67·0	71·8	63·8	65·4	59·1	75·0	53·8	29	85·0	10	58·8	58·5	60·0	59·4	75·7	63·9	87·9	81·8
May	28·053	27·967	28·034	28·010	57·8	68·2	55·1	57·4	48·4	70·1	35·8	24	85·2	18	48·6	49·0	50·0	49·3	72·4	51·2	84·3	78·4
June	·153	28·075	·135	·114	50·1	63·8	49·9	51·5	42·0	65·8	**34·8**	**12**	71·2	30	44·0	49·3	44·8	44·4	80·3	54·3	83·5	81·9
July	·055	27·960	·033	·008	56·0	69·4	54·6	56·8	47·0	71·2	37·2	2	82·2	19	45·8	46·6	46·7	46·3	70·5	46·3	76·1	73·3
August	28·046	·965	28·043	28·006	61·5	71·2	59·0	60·9	51·7	73·1	43·0	4	86·4	29	49·5	49·8	51·3	50·4	66·5	50·7	76·9	71·7
September	27·995	·903	27·992	27·949	64·2	69·9	61·0	62·8	56·0	72·5	41·8	8	90·4	18	55·4	55·7	56·4	55·9	74·2	62·6	85·5	79·9
October ..	·880	·771	·902	·826	71·3	74·3	64·7	67·4	59·1	79·1	45·2	5	96·0	26	56·7	58·0	58·1	57·4	61·2	58·4	79·5	70·4
November ..	·897	·820	·904	·859	70·2	72·1	63·7	66·2	58·8	76·0	45·2	5	97·2	3	57·6	57·6	57·9	57·8	65·8	62·4	81·8	73·8
December ..	27·853	27·793	27·863	27·823	72·5	74·4	67·3	69·3	63·1	78·0	52·2	6	**97·6**	**30**	61·5	61·9	62·0	61·8	69·4	67·0	83·5	76·5
Year ..	27·959	27·884	27·962	27·922	65·8	72·0	62·3	64·2	56·7	75·0	..	..	..		55·9	56·9	56·9	56·4	71·6	60·6	83·4	77·5

Months.	Amount of Cloud.				Rainfall.			Weather, No. of days of							Wind, No. of Observations, at 9 a.m., 3 p.m., and 9 p.m.								
	9 a.m.	3 p.m.	9 p.m.	Mean 9—9	Total.	Max.	Date.	Rain.	Hail.	Thunder-storms.	Clear Sky.	Overcast.	Gales.	Hot Winds.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					In.	In.																	
January	6·6	7·6	9·0	7·8	6·910	2·500	1	20	0	8	1	17	0	2	3	0	41	29	12	4	1	3	0
February	6·0	7 7	9·3	7·7	4·940	1·550	25	13	0	6	1	14	0	1	2	3	26	36	13	2	1	1	0
March	5·8	6·2	7·3	6·6	4·575	1·260	9	17	0	8	3	10	0	1	6	4	27	42	6	4	2	2	0
April	5·6	6·4	7·1	6·4	1·740	0·540	30	12	0	6	2	10	2	3	6	7	23	31	6	6	5	6	0
May	3·0	3·2	3·5	3·3	0·390	0·360	27	2	0	1	11	3	0	1	4	5	23	24	12	16	5	4	0
June	2·4	2·3	2·6	2·5	1·280	1·010	7	4	0	0	19	3	0	0	1	7	12	29	13	21	5	2	0
July	2·1	2·3	3·3	2·7	0·110	0·090	13	3	0	0	18	3	1	3	7	5	19	22	14	14	5	7	0
August	3·3	3·3	5·6	4·5	1·265	0·540	24	6	0	1	11	6	2	4	1	3	23	40	9	9	2	6	0
September ..	5·2	6·0	7·1	6·2	2·440	0·870	2	15	0	10	4	11	0	4	5	6	23	27	10	4	6	9	0
October	4·5	6·4	7 7	6·1	0·935	0·335	11	10	0	4	4	11	2	4	6	6	31	34	9	1	1	5	0
November	5·7	6·3	7·8	6·8	3·185	0·745	19	17	0	5	3	12	0	3	6	5	31	27	10	0	2	9	0
December	6·0	7·5	8·2	7·1	3·840	0·500	3	16	0	10	3	14	1	2	3	9	25	40	9	2	2	3	0
Year	4·7	5·4	6·5	5·6	31·610	..	..	135	0	59	80	114	8	28	50	60	304	381	123	83	37	57	0

IX. *Meteorology of Mozufferpore, Tirhoot, for the year* 1877.

By Charles N. Pearson, F.M.S.

[Received February 12th.—Read May 15th, 1878.]

The year 1877 was an extraordinary one throughout India, and in this district the anomalous character of the season was very marked.

January was, after the 10th, unusually cloudy for the season, and as a consequence of this state of the atmosphere, the night temperature was above the average, while the day temperature was generally below it; the fall of rain, 2·05 in., was above the average. There was a general fall of 1·65 in. on the 12th, and the first north-wester of the season took place on the evening of the 31st, with small hail and 0·84 in. of rain.

The first week in *February* was very unsettled, with cold cloudy weather, and frequent rain. On the 7th, rain fell continuously; this was followed on the 9th by a period of bright clear weather, with cold W wind and a very low temperature, both by day and night, from the 11th to the 17th inclusive; the night temperature fell on each night to 37° or 38°, and white frost occurred on several occasions; this unusual cold was probably the result of a very heavy fall of snow on the Himalayah Mountains, several feet of snow having fallen at Simla and Mussoorie between the 1st and 8th, which, extending as it did to a very low elevation, and being succeeded by a brisk NW wind, caused a general refrigeration of the atmosphere. After the 17th the weather was seasonable, but still cooler than usual; altogether this was the coldest month of the cold season, with a temperature lower than that of January.

March was seasonable, the day temperature much lower than in March 1876, the maximum temperature being 85°, whereas it was 97° in the previous year; showers fell on the 16th and 31st, but only 0·25 in. of rain was measured. The rainfall for the quarter ending March 31st was 3·25 in. the showers at frequent intervals were beneficial for the cold weather crops which yielded an excellent harvest.

April was a dry month, only slight showers fell to the aggregate amount of 0·25 in. The first week was unusually cool, and the temperature remained generally relatively cool for the season, the maximum being 95°, against 100° in 1876.

May was a variable month, with frequent short periods of warm and cool weather. This month was remarkable for an unusual fall of rain from SE on the 20th and 21st. It is unusual for rain to fall at this season, except during storms from the NW, accompanied by violent wind, as also by thunder and lightning. In this instance the rain storm approached from the SE: there was very little wind and neither thunder nor lightning. It was general throughout Bengal, in every station the same thing was remarked, viz. the approach of the rain clouds from the SE. The fall was as large as 10 in. at Gyah, and at some other places in Bengal; here only 0·82 in. fell, and as at

Motihari, in Chumparun, some 50 miles north-west of us, none fell, it is to be presumed this station was on the extreme north-west outskirts of the fall. A severe cyclone with heavy rain occurred on the Madras coast on the 16th and 17th, and it seems probable that this rainfall, which began in the southern parts of Bengal on the 18th and gradually worked its way to the north-west, was in some way connected with this cyclonic disturbance; it is very unusual for the effects of a cyclone, unaccompanied by the storm itself, to be traced so far, but I can account in no other way for the extraordinary weather between the 18th and 21st of May. After a few days of calm oppressive weather, the usual conditions of the atmosphere were re-established, and after the 25th the usual storms from the north-west occurred at intervals. The total rainfall for May was 1·89 in.

With *June*, the extraordinary character of the season of 1877 may be said to have commenced. It was a month of great heat and drought, especially from the 9th to the end; the 14th, 16th, 19th, 23rd, 29th, and 30th were periods of intense heat. The maximum temperature ranged on nine days at upwards of 100° in the shade, rising on the 22nd to 106°. Rain was greatly needed at the close. There was an exceptionally severe north-wester on the 1st, with 1·50 in. of rain, but no rain on any other day, except light showers on the 8th and 25th. The monsoon or rainy season is usually expected to set in about the 20th of this month, giving relief from the great heat, but this year it failed to appear, and the heat was greater in the last half of the month than at the beginning. The rainfall for June was only 1·78 in. The average of this month is 8 in., hence it will be seen that the fall in 1877 was greatly in defect.

The first three days of *July* were marked by partial thunderstorms, which considerably cooled the air, though they were hardly felt at this place; heat set in again on the 4th, and prevailed generally till the 18th; during this interval only 1·29 in. of rain fell, and on the 18th the earth was as dry as it usually is in May. On the 6th, 7th, 8th and 16th, the temperature reached 100° in the shade. On the night of the 18th heavy rain fell, and from this time till the end of the month the rainfall was general and heavy, amounting to 9·31 in.

August and *September* were characterised by great heat and drought. The rainfall of August was only 2·91 in., and of September but 2·50 in., or for the two months only 5·41 in. In 1876 the fall in August was 14·59 in., and in September was 23·01 in.; after September 12th, only ·03 in. fell, the sky was clear, except for partial electrical nimbi, the upper current was established from the SW and W, and though the E current was still prevalent next the earth in this district, burning hot W winds blew throughout the Punjaub and North-West Provinces; it was feared that the rains were over, and that a famine worse than that of 1873, and extending over the whole of Northern India, would ensue. On *October* 5th, however, a sudden and remarkable change occurred, and from that day till the 11th abundant rains fell; these rains were remarkable from the large extent of country over which they fell. On the 6th, 7th and 8th, it is estimated that rain fell over an area

Maximum and Minimum Temperatures and Rainfall at Mozufferpore, Tirhoot, 1877.

Date.	January.			February.			March.			April.			May.			June.		
	Max.	Min.	Rain.	Max.	Min.	Rain.	Max.	Min.	Rain.	Max.	Min.	Rain.	Max.	Min.	Rain.	Max.	Min.	Rain.
	°	°	In.	°	°	In.	°	°	In.	°	°	In.	°	°	In.	°	°	In.
1	63	42	..	64	50	..	75	46	..	72	52	·18	91	68	..	95	77	1·50
2	64	40	..	60	48	..	76	49	..	75	51	..	93	68	..	89	68	..
3	63	40	..	64	41	·15	73	49	..	78	56	..	91	67	·10	90	74	..
4	64	42	..	62	49	..	75	47	..	76	58	·01	94	69	..	93	74	..
5	65	45	..	63	43	..	73	50	..	77	57	..	94	70	·61	94	75	..
6	65	43	..	65	42	..	76	50	..	79	60	..	86	65	..	93	75	..
7	64	42	..	56	46	·50	75	50	..	73	62	·03	92	65	..	95	76	..
8	65	43	..	65	50	·11	76	54	..	79	56	..	92	66	·05	91	77	·18
9	64	43	..	60	46	..	77	56	..	82	58	..	87	64	..	96	75	..
10	63	42	..	59	40	..	79	59	..	80	62	..	91	65	..	97	77	..
11	68	46	..	59	37	..	80	57	..	83	63	..	94	71	..	96	77	..
12	56	54	1·65	59	37	..	80	53	..	83	64	..	96	70	..	96	76	..
13	59	51	..	60	38	..	80	62	..	88	65	..	97	72	..	95	76	..
14	61	47	..	61	38	..	81	59	..	88	63	..	99	70	..	102	78	..
15	60	42	..	62	37	..	75	62	..	91	62	..	98	68	..	100	80	..
16	64	48	·06	62	37	..	77	59	·05	90	65	..	97	72	..	101	81	..
17	65	46	..	62	37	..	74	51	..	91	57	..	97	76	..	96	82	..
18	66	46	..	64	40	..	75	50	..	92	59	..	95	76	..	99	81	..
19	65	51	..	65	41	..	77	52	..	93	62	..	87	75	..	100	80	..
20	65	45	..	65	42	..	81	55	..	91	67	..	78	71	·50	102	79	..
21	66	52	..	67	41	..	82	61	..	90	60	..	88	71	·32	102	82	..
22	63	44	..	67	48	·19	84	59	..	92	61	..	92	73	..	106	82	..
23	65	46	..	69	47	..	84	57	..	94	63	..	95	74	..	101	83	..
24	66	44	..	70	49	..	85	57	..	93	67	..	99	74	..	99	81	..
25	65	42	..	67	41	..	80	62	..	94	66	..	95	75	..	98	81	·10
26	64	42	..	72	44	..	82	54	..	95	66	..	95	74	..	96	79	..
27	67	43	..	72	45	..	84	53	..	94	66	·03	93	76	·10	95	82	..
28	65	44	..	73	45	..	85	62	..	94	70	..	94	72	..	95	80	..
29	66	45	..	..	..	..	84	55	..	93	66	..	97	72	..	99	80	..
30	66	49	..	..	..	..	83	58	..	90	66	..	91	74	·21	103	80	..
31	71	52	·34	..	..	..	73	57	·20	..	..	..	95	75	..	..	..	..
Means	64·3	45·2	2·05	64·1	42·8	0·95	78·7	55·0	0·25	86·3	61·7	0·25	93·0	70·9	1·89	97·1	78·9	1·78

—[illegible] and Rainfall at Mozufferpore, Tirhoot, 1877—*Continued.*

Date.	July.			August.			September.			October.			November.			December.		
	Max.	Min.	Rain.	Max.	Min.	Rain.	Max.	Min.	Rain.	Max.	Min.	Rain.	Max.	Min.	Rain.	Max.	Min.	Rain.
	°	°	In.	°	°	In.	°	°	In.	°	°	In.	°	°	In.	°	°	In.
1	90	78	·07	88	77	·02	90	77	..	87	71	..	80	60	..	68	43	..
2	91	77	..	87	78	·19	91	77	..	87	74	..	81	59	..	67	42	..
3	96	78	..	88	78	·07	93	76	..	85	72	..	79	57	..	67	41	..
4	96	76	..	91	78	..	97	76	..	88	73	..	79	55	..	69	43	..
5	99	79	..	92	78	..	95	79	·05	89	73	·10	77	54	..	70	45	..
6	101	76	..	95	81	..	80	74	2·15	80	68	3·34	78	56	..	70	45	..
7	101	81	..	97	80	..	87	76	·02	82	70	·40	77	57	..	73	46	..
8	101	77	·10	98	80	·14	86	78	·03	78	71	·31	77	56	..	70	53	..
9	95	74	·78	93	76	·15	83	78	·02	86	68	..	80	59	..	70	51	..
10	99	79	·02	90	77	·01	86	76	·09	81	72	1·00	78	57	..	74	53	·10
11	97	78	..	95	78	..	91	77	·08	85	71	·80	77	55	..	70	58	..
12	93	78	..	97	79	..	90	74	·03	86	68	..	77	54	..	62	43	..
13	89	79	·10	97	80	·04	91	74	..	86	69	..	78	55	..	64	40	..
14	89	77	·13	92	75	·90	91	76	..	84	66	..	77	56	..	62	42	..
15	98	77	..	93	79	..	90	75	..	84	65	..	77	57	..	62	42	..
16	100	79	..	97	80	..	92	75	..	82	64	..	77	56	..	62	38	..
17	98	81	·09	97	80	..	93	74	..	86	66	..	76	55	..	65	41	..
18	95	82	1·40	91	78	..	91	73	..	87	66	..	76	56	..	67	45	..
19	86	78	2·14	88	73	·55	92	78	..	85	67	..	77	56	..	73	52	..
20	93	75	·27	91	77	..	93	79	..	86	66	..	78	57	..	70	52	..
21	91	80	·11	88	78	·15	91	76	..	84	60	..	78	58	..	65	48	..
22	91	76	·85	88	75	..	90	77	..	82	57	..	77	58	..	64	44	..
23	92	77	·15	90	77	..	89	77	..	81	58	..	78	56	..	69	46	..
24	88	75	·22	90	78	..	90	76	..	80	55	..	78	58	..	69	47	..
25	93	76	..	86	78	·04	91	77	·03	81	57	..	78	59	..	71	48	..
26	95	80	..	92	77	·08	91	77	..	80	58	..	77	56	..	71	52	..
27	93	79	..	94	75	..	93	77	..	80	58	..	79	56	..	69	54	..
28	91	80	·42	94	77	..	90	77	..	81	61	..	75	54	..	70	49	..
29	89	75	1·10	94	78	..	92	77	..	80	60	..	75	50	..	73	53	·10
30	90	77	..	87	79	·57	90	76	..	82	59	..	72	48	..	68	58	·96
31	85	76	1·36	87	78	..	..	..	..	82	62	..	..	..	..	69	54	..
Means	93·7	77·7	9·31	91·8	77·8	2·91	90·3	76·3	2·50	83·5	65·3	5·95	77·4	56·0	0·00	68·2	47·4	1·16

of country at least 1,000 miles in length, and of nearly the same distance in breadth. These rains completely changed the aspect of affairs throughout Behar and Northern India, and saved the country from famine, though much of the rice on the high lands had been irremediably lost before the rain fell, so partial scarcity and high prices may be expected to prevail. The rainfall from the 5th to the 11th inclusive was 5·95 in., being considerably more than the fall of both August and September, an occurrence, I imagine, unprecedented or nearly so in the annals of India. After the 11th no more rain fell.

The month of *November* was remarkable for a very steady and high temperature for the season till the 29th, when a fresh W wind brought in the cold; dews were heavy, but no rain fell. *December* was remarkable for great and sudden changes from cold to heat, and *vice versâ*, the fall between the night of the 11th and 12th being as much as 15°; the period from the 12th to 17th was unusually cold, both by day and night; the 10th, 11th, 19th and 26th to 31st were warm for the season. On the 27th and 28th fogs prevailed. The weather this month was generally more cloudy than usual, and changeable; there were two showers of rain, one, a light one, 0·10 in., on the evening of the 10th, the other heavy, 1·06 in., on the night of the 29th and 30th; this latter rain was much wanted for the winter crops, and will greatly benefit them. The total fall for December was 1·16 in.; rain in this month is somewhat unusual, it does not generally fall before January.

The total rainfall for the year was 29·00 in., being little more than half the average; the year closed with far brighter prospects than could have been anticipated, owing to the opportune rainfall of October and December. The peculiarity of the year 1877, which so nearly caused the most disastrous results, was the almost total failure of the rains of the SW monsoon over the whole of Northern India. In Agra, the fall of rain till October was not more than 8 in. Indeed, this district was almost on the extreme western confines of the monsoon, the weather in the adjoining districts to the west being perceptibly drier and hotter than in this. On the other hand, in Durbhungah, only 84 miles east, the rains were much more abundant than here; the total rainfall at Durbhungah for the year was upwards of 50 in., and eastwards, throughout Bengal, the SW monsoon was highly favourable. But the rains of this year did not extend westwards beyond Behar. In the North-West Provinces and Punjaub the heat and drought were intense, killing the grass, and even scorching large trees.

I may, perhaps, observe here that Madras after the month of August was favoured with abundant rains; the NE monsoon from October to December was also characterised by a rainfall that was even excessive: the year, therefore, closed with cessation of famine and prospects of abundant harvests in Southern India. For position of instruments, and remarks on the district of Tirhoot, I may, perhaps, be allowed to refer to my papers on the Meteorology of Mozufferpore for 1875 and 1876. (Vol. III. pp. 222, 410.)

X. *On the Auroral or Magnetic Cirrus.* By the Rev. SAMUEL BARBER, F.M.S.

[Received April 12th.—Read June 19th, 1878.]

Some six or seven years ago a discussion took place in the pages of 'Nature,' as to whether the Aurora Borealis was ever visible by daylight. After a good deal had been said on both sides, the question was, I believe, finally decided in the affirmative. Admitting the accuracy of the observations brought forward, the evidence seemed to be conclusive; and I do not desire at the present time to raise this question again—but having contributed my mite in favour of the visibility, or rather, of the daylight manifestation of magnetic force, I will merely add that subsequent observations have confirmed the result then arrived at.

The subject of magnetic disturbances is, however, also interesting from its connection with certain forms of cloud,—especially that which has been termed 'Auroral' or 'Magnetic' Cirrus. The fact that atmospheric electricity has a powerful influence in the generation of several species of cloud, will probably be admitted by all who have observed the sky in stormy weather; and this seems to be specially true of Cumulus and Cirrus. At the present time my object is to note the occurrence of a symmetrical form of Cirrus (popularly known as Noah's Ark) in connection with a manifestation of the Aurora, on October 23rd, 1877; and I should be glad to know whether on this occasion any other observers took note of the appearance. Such observations as go to prove a connection between magnetic disturbances and the various cloud forms are very interesting, both with respect to those forms themselves, and the supposed relations existing between the magnetism of the earth and atmospheric electricity. Let us hope that the elucidation of the laws bearing on the subject may become useful in weather forecasts.

On October 23rd, 1877, after a close showery day, with occasional squalls, a fresh breeze sprang up in the evening, when the lower bank of low flying cumulus cleared away, leaving a zone or belt of linear cirrus running about NNW and SSE. About 7.50 p.m., when I first observed this belt of cloud, the separate bands of which it was composed had a luminous ruddy tinge, and flushed faintly almost from end to end simultaneously; not with a running or wavy motion, as has often been observed in the case of that form of Aurora which converges near the zenith. The texture of these bands exactly resembled that of the hazy cirrus, or, as Howard would say, cirro-stratus, which is often the originating medium of the ordinary halo. In fact, there was a well-defined lunar halo when this observation was made. The bands of cloud were quite symmetrically arranged, and covered nearly the whole heavens.

At 8.10 p.m. I took another observation. The bands of cirrus had become broader, and their tint was whiter: some had a pale greenish cast. The halo had grown very distinct and had an unusually luminous appearance.

But the chief point to be noticed at this period is the fact that the cirrus bands had become more definite in form, and crossed the arc of the halo in such a way as to *break its outline and destroy its symmetry*. The irregularity of form resulting from the peculiar motion of the cloud particles seemed to be a positive indication, I may perhaps say a visible indication, that the particles were affected by the magnetic waves. A certain amount of irregularity in a halo is not very unusual when there is much cloud; but when the arc alters its form during a few moments' observation, as under the circumstances now recorded, we have a definite intimation that the refracting property of the ice crystals is disturbed by some abnormal force. The motion and flashing of the bands of cirrus were now so distinct as to leave no doubt as to the presence of magnetic action; or of some force acting almost instantaneously across the whole expanse of sky. The longer bands of cloud were accompanied by shorter pieces that lay parallel to one another, and resembled in form that kind of stratus which often precedes a gale:—the surface unbroken, and the ends tapering off so as to give a fish-like outline. This is the form of cloud which, when partaking more of the cirrus type, and when seen at a great elevation, gives rise to the weather proverb, '*Hen's scarts**' and filly tails *make lofty ships to carry low sails*.' On this occasion these clouds seemed to flash out, or rather to be struck out instantly from end to end as by some force which condensed at once the invisible vapour lying in this particular form. The phenomenon may serve to remind us of an undoubted fact with regard to the genesis of cloud forms, viz. that these may exist, not merely potentially, but actually in an invisible state, or, to put the case in another way, an aggregation of vapour or ice-particles may take place in a particular generic form, and remain invisible till a certain degree of condensation is attained from the effect of external forces, the action of which may at any moment determine the visibility of the cloud by affecting the polarity of its particles. And it appears highly probable, from such observations as those now recorded, that terrestrial magnetism exerts this action upon cloud forms. We have to account for the fact of an ordinary lunar halo rapidly changing its form under the influence of *magnetic waves:* that is, if we are justified in regarding the auroral currents as the result of magnetic action. In regard to the halo itself, it will scarcely be denied that its origin is due to floating ice crystals, and the degree of distinctness and chromatic effect will depend upon the extent of congelation. As I have suggested in a recent notice† of these phenomena, the changes of form may be much affected by a slight melting of the surface of the ice-particles. But whether the condensation and polarity of these particles, in such cases as we are now treating, is affected directly by electrical or magnetic force, or whether these latter affect them by development or absorption of heat, is difficult to determine; indeed, the relation or connection (which I take to be now demonstrated) may possibly be one of co-ordination

* Scarts = scratchings.

† Quarterly Journal of Science, January, 1878.

merely, not of cause and effect; the primary controlling force being, so to speak, external both to those of electricity and cohesion. As stated above, we have to account for the fact of ice-particles in the atmosphere altering their degree of congelation under the influence of auroral waves, and of cloud forms altering their degree of visibility from the effect of the same force.

These and kindred observations are interesting in their relation to the theory of Sir David Brewster, that the earth's magnetism is induced by the development of atmospheric electricity. If it be granted that terrestrial magnetism has at times a powerful action on the molecular movements of the watery atmosphere, is it not probable that there is also occasionally a force of attraction between the *mass* of the watery particles and the earth which they envelop? And if a force of *attraction*, are we not justified in surmising that there may also occasionally be a force of repulsion?

DISCUSSION.

Rev. W. CLEMENT LEY sent the following Note to the SECRETARY :—

As a cloud observer, I ought perhaps to contribute my mite to the discussion on this paper. A good many years ago I commenced an examination of the form and direction of cirrus bands and fibres, in order to discover whether there is or is not any connection between these and the arches and streamers of Aurora. I continued this study for several years, with the conclusion that, for my own part, I could make out no such connection. The direction of the bands of cirri I found to coincide slightly, and but very slightly, with the magnetic meridian more frequently than to be transverse to that meridian; but the mean direction of the bands is not coincident with the magnetic meridian, though it is a little nearer to it than to the transverse direction. The directions of the cirrus bands undergo perpetual change; and the directions are different at the same time over different parts of Europe, and even of the British Isles, as is abundantly proved by the returns of those observers who have been so kind as to send me observations on this subject. The directions of these bands are undoubtedly dependent upon, or at least connected with, the distribution of atmospheric pressures and currents. No relation has hitherto been pointed out, or is, I think, at present discoverable, between the condition of the atmospheric currents and the auroral manifestations. The latter are associated with magnetic storms, as every one knows, which "are not connected," so far as we can say at present, "with any known disturbance of the atmosphere[*]," whatever writers like M. Faye may say to the contrary. The altitude of auroræ, though very variously determined and probably very variable, is certainly vastly greater than that of the cirrus clouds. Therefore even if we admit (as I am not prepared to do) that the directions of the bands and fibres of cirrus are determined by conditions similar to those which determine the position of the arches and streamers of the aurora, we shall still expect no distinct relation to be traceable between the lines of the cirrus and of the aurora, for most cloud observers will have noticed clouds differing from one another by only one or two thousand yards in altitude arranged in bands which are far from parallel.

On the other hand, I must admit that some good authorities have believed in the existence of the relation which I cannot trace. Especially I would call Mr. Barber's attention to an old paper in the Philosophical Magazine (for July, 1853) by Mr. W. Stevenson, of Dunse, one of the most careful and laborious cloud observers,—a paper which contains the record of numerous phenomena similar to that which Mr. Barber describes. I must however express my belief, that the so-called "auroral," "phosphorescent" or "luminous" cirrus, is simply cirrus

[*] Airy Magnetism, p. 204.

through which auroral light is seen. I have on nine occasions seen an Aurora through a veil of Cirrus or Cirro-stratus, and on these occasions the pulsations of the Auroral light appeared as if proceeding from the cloud, though their source was in reality far more distant: the effect being very similar to that produced by lightning reflections rendering thin clouds temporarily luminous. As for actually phosphorescent clouds, the evidence for their existence is undeniably strong, but for my own part, after cloud-gazing nearly every night of my life I have never been favoured with the sight of one, and therefore am driven to believe that the phenomenon is, in our regions of the globe at all events, decidedly exceptional.

Mr. WHIPPLE thought that the hypothesis of changes in the form of cirrus cloud in the instance quoted by Mr. Barber, could be at once put to the proof by the examination of the records of self-registering magnetical and electrical instruments for that date. Disturbances of either of the elements, terrestrial magnetism or atmospheric electricity, were always indicated by these instruments. His own opinion was, that the air was much too dense at the low heights at which cirrus cloud and halo forming crystals floated, to enable the Auroral discharge to take place. He was also unable to think with the author, that there could be a sufficiently intense magnetic field of force generated by the action of terrestrial magnetism to alter the refractive properties of ice crystals, when it is considered how very insignificant the Earth's magnetic force at the time of its greatest intensity is, when compared with the intense forces Faraday was compelled to use in order to find out the relation between magnetism and light.

Note, June 21. An examination of the magnetograph and electrograph curves at the Kew Observatory, shows perfect absence of disturbance of either of the elements between 7 and 9 p.m. on October 23rd, 1877, and therefore it is certain that no aurora occurred on that date.

XI. *Note on the Mean Relative Humidity at the Royal Observatory, Greenwich.* By WILLIAM ELLIS, F.R.A.S.

[Received May 9th.—Read June 19th, 1878.]

AT the time when Dr. Tripe's paper 'On the Winter Climate of some English Sea-side Health Resorts'* was before the Society for discussion, it occurred to me that it might be useful to determine the mean relative humidity at Greenwich, in each month of the year, for those hours at which the observers under the direction of the Meteorological Society make their observations, 9 a.m. and 9 p.m., and show the difference between the mean values at these hours and the true mean monthly values. Because the deviations at these hours at Greenwich might serve to indicate, for many of the Society's observing stations, the direction in which the corresponding values at those stations might be expected to deviate from mean values, and, approximately also, the amount of deviation. The results are contained in the following table. They are derived from the discussion of the photographic records of the dry-bulb and wet-bulb thermometers for the twenty years 1849 to 1868, and are deduced from mean values of the dry-bulb and wet-bulb. Complete saturation is represented by 100.

* Quarterly Journal, Vol. IV., p. 111.

.—**Mean Monthly Degree of Humidity at the Royal Observatory, Greenwich, s deduced from the photographic records of the Dry-Bulb and Wet-Bulb hermometers, for the Twenty Years 1849 to 1868.**

Month.	Mean Monthly Degree of Humidity.				Excess above Mean from 24 hourly values		
	At 9 a.m.	At 9 p.m.	Mean of 9 a.m. and 9 p.m. values.	Mean of 24 hourly values.	At 9 a.m.	At 9 p.m.	Of Mean of 9 a.m. and 9 p.m. values.
ıry	88·6	88·7	88·7	87·3	+1·3	+1·4	+1·4
ıary	88·1	87·3	87·7	85·2	+2·9	+2·1	+2·5
ı	82·4	84·3	83·3	80·9	+1·5	+3·4	+2·4
.....	75·9	81·9	78·9	76·9	−1·0	+5·0	+2·0
.....	73·0	82·3	77·7	75·4	−2·4	+6·9	+2·3
.....	70·2	80·4	75·3	73·2	−3·0	+7·2	+2·1
.....	70·0	80·0	75·0	72·3	−2·3	+7·7	+2·7
ıt	73·6	83·4	78·5	76·2	−2·6	+7·2	+2·3
mber	80·0	87·5	83·7	80·1	−0·1	+7·4	+3·6
er	86·3	90·3	88·3	86·3	0·0	+4·0	+2·0
nber	89·2	89·8	89·5	87·3	+1·9	+2·5	+2·2
ıber	89·0	89·2	89·1	87·5	+1·5	+1·7	+1·6
ıns	80·5	85·4	83·0	80·7	−0·2	+4·7	+2·3
r Reference..	1	2	3	4	5	6	7

ı 5 shows that at Greenwich the 9 a.m. value is smaller than the ıummer, and larger than the mean in winter: column 6 shows that ı. value is larger than the mean throughout the year, but much n the mean in summer: column 7 indicates that the mean of the d 9 p.m. values deviates from the true mean by nearly the same n each month of the year, being always too large. The mean values (column 4) change little from April to August, and from o February; there is a great decrease between February and April, responding great increase between August and October, the months and September having intermediate and nearly equal values.

ıt proposed that the differences for Greenwich should be generally ı corrections to determinations made at other places at 9 a.m. and ır the corrections in any month would probably vary with different humidity. But the differences indicate, as I have already said, way mean values at these hours at other stations may on the ıe expected to deviate from true mean values. As a matter of ve examined, though not with any great exactness, the monthly results deduced from the observations made at the Society's ı 1875 and 1876, and find that the differences between the 9 a.m. m. results, in very many cases, agree nearly with those of the table. The values themselves, at many of the stations, appear, to be generally greater in these years than the corresponding ı values.

It may be useful to add for Greenwich the greatest and least monthly values of humidity, found for each of the twelve months since observations of the dry-bulb and wet-bulb thermometers have been made. For this purpose I have employed the longer series of results deduced from eye observations of the dry-bulb and wet-bulb thermometers taken several times each day, and corrected for diurnal inequality in the usual way. This series commences with the year 1841, but as the thermometer stand was, in the year 1846, shifted from the north to the south side of the Magnetical and Metecrological Observatory, the results for the thirty years 1847 to 1876 only have been used. The numbers, as extracted from the volumes of Greenwich Observations, are contained in the following table, the mean monthly values for the whole period being added for comparison with those given in Table I.

TABLE II.—Greatest, Least, and Mean Monthly Degree of Humidity at the Royal Observatory, Greenwich, as deduced from eye observations, 1847 to 1876.

Month.	Greatest Monthly Value.	Least Monthly Value.	Mean Monthly Value.
January	92	79	86·3
February	91	76	83·9
March	90	74	80·9
April	86	69	78·0
May	85	63	75·3
June	82	66	74·2
July	83	63	74·1
August	83	65	75·2
September	88	72	79·2
October	93	78	86·3
November	94	81	87·4
December	92	78	87·6
Mean	..	..	80·7

The numbers in the preceding table show that the monthly values of humidity at Greenwich vary considerably in amount in every month of the year. The mean values generally closely agree with the mean values derived from the photographic records given in Table I. The general mean 80·7 is precisely the same. The dry months in summer appear to be warm months, and the humid months cold, but in winter there seems to be no marked distinction, as regards temperature, between dry and humid months.

There is one point in the determination of relative humidity from observations of the dry-bulb and wet-bulb thermometers that should be borne in mind, and that is the effect of small errors in the index corrections. Should the corrections applied be so far uncertain as that, by a combination of errors, the difference between the dry-bulb and wet-bulb thermometers could be erroneous by as much as 0°·5, this, at a temperature of 50°, may make a difference of as much as 8 in the deduced humidity, more at lower temperatures, but rather less at higher temperatures.

DISCUSSION.

Mr. DINES said he was glad to corroborate the figures given by Mr. Ellis in his paper. At the time Dr. Tripe's paper was under discussion he had taken out all the returns he could find relating to Greenwich, and on plotting them together with those given in the paper, they agreed so nearly that they might be considered as one curve; as far therefore as the figures went they might be taken as data. The only part of Meteorology he proposed to study was that connected with vapour, and he frequently took the dew point direct, twenty, or even fifty, times a day. In his opinion this part of the question was in the most unsatisfactory condition, and as the Fellows would not meet again for some time, he was glad to have the opportunity of stating his reasons for coming to that conclusion. Six years ago * he had remarked "that whatever tables may be used, the dry and wet bulbs could never be depended upon as giving more than an approximation to the dew point." He repeated that statement to-night, not with doubt or hesitation, but in the strongest language he knew how to use. Again, the figures in Mr. Ellis's tables were worked out from an open stand, and Mr. Glaisher's tables the same, whereas the Society used a closed stand; his opinion as to the difference caused by these stands was well known, and he would not repeat it; but the discrepancies due to other causes were so serious, that in discussing the question as to whether the stands made a difference of 1° or 2°, they appeared to him to be straining at a gnat while they were at the same time swallowing a camel. He had two sets of dry and wet bulb thermometers precisely similar, by the same maker (Casella). On Monday last these were carefully mounted, and placed side by side in the different stands (4 ft. above the ground). In calculating the dew point from the two stands, they only differed 1°·7, but the difference from the dew points as taken by his hygrometer was 5°·9. Then as to the degree of Humidity (saturation = 100) the two stands differed only 4·7 per cent., but if compared with that given by the dew point taken direct the difference was 14·3 per cent. On the day he had named more than ordinary care had been used, but it must not be supposed he had given them an exceptional case; he had many other days like it in his books, and only the previous day, after a heavy shower, with a difference of 5° between the dry and wet bulbs, the wet bulb was of the same temperature as the dew point. He would now give an instance of what he called a good day, when all worked smoothly together:—On June 11th, 1877, with a difference of 12° between the dry and wet bulbs, the dew points only differed 0°·2, and the Humidity only 1·4 per cent. Supposing the means for determining the dew point correctly at hand, he was sorry to say their difficulties were not over; on some days it was almost impossible to say what the dew point really was; every puff of wind seemed to come charged with a different quantity of moisture, and he had frequently seen the dew come and go on his hygrometer, like a flash of lightning, 5° or 6° above what would generally be taken as the dew point. Again as to elevation, generally speaking the dew point was 1° to 2° higher near the ground than at 4 ft. above it, and at 50 ft. high it was from 2° to 6° lower than near the ground. After these remarks he need scarcely say that he agreed with their late President (Mr. Eaton) in doubting the advisability of separating the tension of dry air from that of vapour, and in giving the latter to three places of decimals, the figures of which really meant that there was sufficient vapour above us to cover the ground with water to a depth of 5 inches, whereas he thought (and he believed he was not alone in his opinion) that one-third or one-half of that amount would be nearer the truth; but perhaps it was best to say they did not know much about it. He had forgotten to mention that on one evening in the last month there was a difference of 33 per cent. in the degrees of Humidity at 4 ft. and at 50 ft. above the ground; and on calculating the tension of vapour at the two elevations, and taking the difference, he was called upon to believe that within 50 ft. of the earth there was vapour enough to cover the earth with water to the depth of an inch, enough to saturate the air one hundred times over; to those who believed in the correctness of the method now adopted, there was no escape from this dilemma. He feared the whole thing was rotten to the core.

* British Association Report for 1872, p. 59.

Dr. TRIPE agreed with Mr. Dines that the indications of the dry and wet bulb thermometers should not be too greatly relied upon, and for this reason the Society does not now work out the hygrometric deductions for every day from the observations at their stations, but calculates them from the monthly means. As they have the daily observations, they can in after years have the observations worked out correctly, when more accurate tables can be formed.

Mr. STRACHAN said that there was one thing that might be said in favour of the hygrometrical results obtained by the Tables at present in use, and that was that there was a marked agreement between the results for different adjacent stations.

Mr. SYMONS thought that the results of the dry and wet bulb thermometers were very doubtful.

Mr. ELLIS remarked, through the Secretary, that it might be mentioned that, although the factors used in determining the dew-point from observations of the dry and wet bulb thermometers will not, in every individual case, give the same dew-point as direct hygrometrical observation, they appear fairly to do so on the average; indeed, the factors are based on comparisons of the dry and wet bulb thermometer indications with direct observations. Whatever, therefore, may be its deficiencies, the wet-bulb thermometer, being in nearly universal use, should not be hastily discarded, at least until some instrument as ready and efficient, and as likely to be as generally used, is devised. The instrument gives us useful information which we do not get, and which, at present, we are not likely to get, in any other way.

XII. *On a Method of sometimes determining the amount of the Diurnal Variation of the Barometer on any particular day.* By the Hon. RALPH ABERCROMBY, F.M.S.

[Received April 24th.—Read June 19th, 1878.]

THE method which has hitherto been universally adopted, in treating of the diurnal variations of the barometer, has been to take the mean value of a large number of observations at each hour of the day, and to draw deductions from the average amount of variation thus determined.

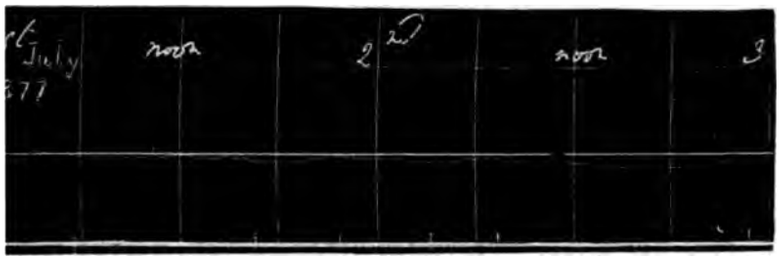
In a former paper, the author has shown that the diurnal barometer variation is seen, from the inspection of barograms, to be always as it were superimposed on the larger fluctuations of pressure due to the passage of cyclones, &c. Also, that the actual amount differs from day to day, and that it is from observation of the kind of weather which is associated with large or small variation that the cause of the variations will probably be discovered. Hence the desirability of being able to measure, as in the barographic trace for July 2nd, 1877, shown in fig. 1, the actual amount of variation on any particular day.

When the non-diurnal fluctuations of the barometer are curved, it is manifestly impossible to separate them from the diurnal variation, but when, as is often the case, the general motion of the barometer, as seen on a barogram, seems to be a straight line, either rising or falling or steady for any 24 consecutive hours, as in the barographic trace for July 2nd, 1877,* shown in fig. 1, the amount of diurnal variation which overrides it can be determined very approximately by the following considerations.

* In this fig. the letters M1 M2, X1 X2, refer to the 1st and 2nd minima and maxima respectively.

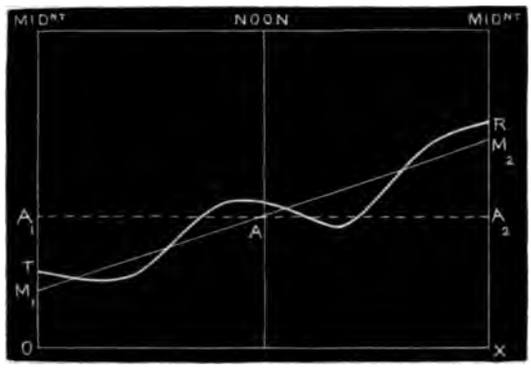
; TR (fig. 2) represent a barographic trace for any 24 hours—say from
ght to midnight—where it is manifest to the eye, that a double-headed
al variation is superimposed on a straight line, which would represent
ypothetical steady rise of the barometer if there were no diurnal
ion. The conditions of that line are evidently, that it should cut off an
on the diagram equal to the total pressure of the day, and be as much
the trace at the second midnight as it was at the first midnight.

Fig. 1.



X 2 M 1 X 1 M 2 X 2

Fig. 2.



draw this line geometrically—
d the mean pressure for the day, either with a planimeter, or from a
ent number of measurements; and mark this height A on the noon
ate, then it is evident, that any line drawn through A, which also
ects the two midnight ordinates, cuts off an area equal to the total
ire of the day, and that the line M_1AM_2 where $TM_1=RM_2$ is the line
red.

draw the same line analytically—

= height of hypothetical line M_1 M_2 at any moment,
= mean pressure of 24 hours,
= OT height of trace at first midnight,
= XR ,, ,, second ,,

$M_1\ M_2$ = height of hypothetical line at first and second midnights respectively,
θ = the time measured along OX,
a = length of base OX when $\theta = 360°$,
d = difference TM_1 or RM_2,

$$\text{Then } \frac{m_1 - d + m_2 - d}{2} = A = \frac{M_1 + M_2}{2}$$

Whence d and $M_1\ M_2$ are found, and the expression for the hypothetical line $M_1\ M_2$ becomes—

$$h = M_1 + \frac{(M_2 - M_1)}{a}\ \theta \text{ for a rising barometer,}$$

$$\text{and } M_1 - \frac{(M_1 - M_2)}{a}\ \theta \text{ for a falling barometer.}$$

The difference between this expression, and the height of the trace gives the amount of diurnal variation at any moment.

As to the value of the method, it is evident that its accuracy depends on the diurnal variation being the same at the first, as at the second midnight, which is not always the case. The difference however, is always small, and the error at noon, from the nature of the point A is always very small; and for the same reason the 10 a.m. and 4 p.m. variations are always given with great accuracy.

Hence if the variations at any particular hour is under investigation, it is best to keep that hour as near as possible in the middle of the 24 hours which are selected for operation.

Note added July.

Allusion was made during the discussion on this paper, to a somewhat similar method suggested by Kämtz, which is quoted here in his own words —as given in the Quart. Journal Met. Society, Vol. III., page 130—"If, therefore, at one place, hourly observations have been made for several years, and if for each month, the mean of the temperature observed at the same hour is taken, it is not strictly correct, if we consider these means obtained to be such as belong exactly to this day; but we have in the numbers found, on the one hand, quantities belonging to the daily period, and on the other hand, the variation which corresponds to the march of temperature from the end of the previous to the beginning of the following day. If we draw the yearly temperature curve from many years' observations, the portion which corresponds to April is nearly a straight line, therefore the temperature rises from one day to the following by about the same quantity. If, then, according to these observations, the 1st May was 6° warmer than the 31st March, the mean of each day would be about 0°·2 warmer than the previous day; if we distribute this over the hours, each would take $\frac{0°{\cdot}2}{24} = 0°{\cdot}0083$; if the hours are reckoned from 1 to 24, indifferently as to which hour 1 corresponds, the 24th is, owing to this circumstance, 0°·19 warmer than that indicated by 1, and in a strict calculation of the period regard must be paid to this change in each individual calculation."

The above method is correct where averages are used, which give the level of variation; and in general idea is the same as the method employed in this paper. Still, the author believes that there is a certain amount of novelty in the paper, as it is the first attempt that has been made to determine diurnal variation from observations of a single day, and to dispense altogether with the use of averages; and secondly, that there is some novelty in the method of finding the level of variation by the condition of the quality of the areas TOXR, and M_1OXM_2. (Fig. 2, p. 199.) The mean pressure for the whole day is only used as a convenient geometrical method of finding the total area M_1OXM_2., and it would be very easy to give an analytical expression for the position of the line M_1M_2 in which the mean pressure for the day did not appear.

DISCUSSION.

Mr. SYMONS said, that it might be convenient to mention, that a very similar method to that described by Mr. Abercromby, would be found in Major Williamson's work "On the use of the Barometer on Surveys and Reconnoissances." (New York, Van Nostrand & Co., 1868.)

Mr. C. HARDING quoted Kämtz as an author who calls attention to a method of obtaining the correct diurnal range from observed values, and stated that he himself had used the method very greatly, with what modifications might be necessary. He explained the method, and remarked that he believed it would give the same results as those to be obtained by the method described by Mr. Abercromby.

Mr. STRACHAN said, that the methods mentioned by Mr. Abercromby and Mr. Harding were practically the same. He could not understand how it would be applied when the barometer was falling during part of the period, and rising or stationary the other part. He thought it best to give the averages exactly as they were struck, without applying any correction whatever, but Mr. Abercromby's geometrical solution was certainly novel and ingenious.

Mr. ABERCROMBY had never seen Kämtz's method, which had been alluded to by Mr. Harding, but from what he could gather from the cursory explanation given, he thought that it was something like the method described in the paper. With regard to Mr. Strachan's inquiry as to the manner of ascertaining whether the barometer was rising or not, or whether its motion was sufficiently straight to measure, that could only be done by looking at the trace, and must rest with the judgment of the observer.

XIII. *On the relative duration of Sunshine at the Royal Observatory, Greenwich, and at the Kew Observatory, during the year* 1877. By G. M. WHIPPLE, B.Sc., F.R.A.S., F.M.S., Superintendent of the Kew Observatory.

[Received May 31st.—Read June 19th, 1878.]

THE Meteorological Council having been favoured, by the kindness of the Astronomer Royal, with an abstract of the observations of the duration of sunshine, made at the Royal Observatory during the year 1877, I have been requested by Mr. Scott to institute a comparison between them and the corresponding observations made at the Kew Observatory.

The results at Greenwich were deduced from records obtained by the instrument described by Mr. Ellis in his paper read before the Society on

June 20th, 1877. (See Vol. III., page 460.) Those at Kew were made with the modified form of the instrument described by Mr. Scott in the Quarterly Journal, Vol. III. p. 19.

As already stated by Mr. Ellis, the registering material employed at Greenwich was not the same throughout the year, but the white cardboard which was used from January 1st to February 26th was abandoned in favour of blackened cardboard, this in turn being superseded by blackened millboard

TABLE I.—Showing the daily duration of Sunshine at Kew and Greenwich for the year 1877.

Date.	Jan.		Feb.		March.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.	
	Greenwich.	Kew.	Greenwich.	Kew.	Greenwich.	Kew.	Greenwich.	Kew.	Greenwich.	Kew.	Greenwich.	Kew.	Greenwich.	Kew.	Greenwich.	Kew.	Greenwich.	Kew.	Greenwich.	Kew.	Greenwich.	Kew.	Greenwich.	Kew.
	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.	h.
1	0·7	0·3	0	0	3·9	5·7	0	1·3	0·2	0·1	2·5	0	0·5	1·9	2·3	5·8	9·8	10·9	2·2	5·1	2·6	6·9	0	2·2
2	0	0	0	0	0	0	3·1	2·1	1·2	5·1	0	0·4	1·0	4·0	6·1	11·7	7·8	7·5	5·4	5·8	1·1	0·6	2·5	3·3
3	0	0	0	0	0	0	0·5	0·4	4·3	1·3	12·6	12·5	9·9	..	3·8	5·4	0	0·1	3·7	7·6	5·1	7·4	0	0
4	0	0	0	0	0	0	3·4	1·2	5·2	1·9	9·8	9·1	8·0	10·0	3·2	5·7	5·8	8·9	1·8	2·9	1·8	1·6	0	0
5	1·3	2·2	0	0	3·0	4·7	5·5	4·2	9·0	9·9	8·6	6·5	10·9	8·1	10·9	12·0	9·5	11·0	7·0	3·0	3·4	5·1	0	0
6	0	0	0	0	0	0	3·8	4·5	12·5	12·0	6·5	3·3	8·3	8·0	2·0	4·2	9·5	10·5	6·8	3·3	0	0	0·3	0·1
7	0·3	0·8	0	0·3	1·4	1·7	4·1	4·4	13·0	12·1	11·0	8·2	8·2	7·4	2·0	10·2	3·1	4·2	0	0·1	0	0	0	0
8	0	0	2·2	5·5	5·4	7·2	1·4	0·8	10·5	7·4	8·1	8·7	4·7	4·4	7·9	2·0	2·0	2·8	2·2	5·6	4·9	6·1	1·7	5·1
9	0	0	0	0	2·4	1·4	0	0·1	7·4	7·4	13·7	12·2	1·4	1·7	6·1	4·3	2·4	3·8	4·1	6·1	0	0	1·9	5·2
10	0	0	0	0	5·2	1·9	0·2	0·8	6·3	5·6	13·2	12·0	11·0	10·6	7·8	5·7	0·7	0·6	0	0	2·6	3·3	0	0
11	0	0	0	0	9·6	9·9	0·6	2·0	1·3	2·9	13·1	9·5	6·2	4·6	4·6	3·6	0·7	2·7	6·2	8·2	0	0	0	0
12	0	1·1	0	0·2	0	0·2	5·8	5·5	0·1	0·4	4·6	3·7	9·0	8·5	6·3	3·9	5·8	7·1	5·1	7·7	3·6	4·6	1·0	3·0
13	1·0	1·0	0	0	0	0	1·1	0·9	0·5	3·5	3·4	1·8	7·7	7·1	4·0	1·7	0·2	0·3	0·4	0	0·3	2·3	2·9	2·6
14	0	5·0	0	1·0	0	0	0·3	0	0	0·2	11·8	8·8	0·5	0·5	6·3	10·1	0	0	6·7	7·1	4·9	4·9	0·2	4·2
15	0·8	0·3	0	0	2·8	0·9	0	0	0	6·6	10·9	9·4	5·5	4·3	5·9	8·9	1·4	4·6	5·6	4·9	0	0	0	0
16	0	0	3·5	6·9	2·7	1·5	1·0	1·7	4·3	4·7	11·9	10·0	2·1	0·2	6·2	6·2	3·6	6·0	1·8	2·6	1·1	3·2	0	0·2
17	0	0	0·5	2·3	5·2	5·5	3·0	4·0	0	3·2	13·3	8·5	0	0·1	7·9	9·7	1·9	3·0	5·7	7·3	1·0	2·8	0	0
18	0	0	0	0	6·3	6·6	0	0	9·7	10·6	12·6	6·3	8·1	7·0	3·4	4·6	2·9	5·1	6·8	5·5	0·7	1·7	1·5	4·7
19	0	0	3·6	5·6	5·4	3·8	4·6	6·9	0·3	1·3	12·1	10·8	0·4	0·9	1·0	2·6	0·2	0	0·4	0·8	0·7	0	0	0
20	0	0	1·5	4·2	0	0	5·1	6·1	0·1	0·1	8·5	6·7	8·6	11·1	5·8	7·7	0	0	8·0	9·4	2·6	3·0	0	0
21	3·1	2·9	0·4	2·5	0	0	0	0	0·8	1·4	7·8	4·2	13·1	11·5	7·7	9·6	5·5	8·6	0	0	0	0	0	0
22	0·4	0	1·0	1·4	2·6	4·6	4·3	4·9	0	0	8·6	7·2	0·3	1·9	8·3	9·8	6·7	9·8	1·6	1·1	2·5	3·7	0	0
23	5·4	6·1	3·3	5·6	6·5	5·0	7·8	7·4	0·2	0·8	4·1	4·2	1·2	0·4	10·1	12·0	0·4	0·8	0	0	5·4	5·4	2·1	3·3
24	2·3	4·6	0	2·1	5·9	6·2	6·5	10·0	2·2	0·5	12·1	12·4	5·6	9·9	8·3	8·2	4·1	5·9	6·8	7·5	0	0	0	1·1
25	0	0	2·0	0·5	5·9	5·9	5·7	1·9	5·5	7·9	8·5	8·0	5·9	5·9	2·1	0	0·3	3·3	0	0	2·4	6·0	3·4	3·3
26	0	0	0·9	3·7	0·6	0·6	0·3	0	4·7	8·3	3·8	2·1	2·3	5·7	1·5	1·1	2·5	4·2	1·7	3·5	0·9	1·7	3·7	5·4
27	0	0	3·5	4·2	3·8	4·6	2·0	1·6	11·0	8·3	4·5	7·9	6·3	8·0	0	0	3·4	0	0·7	1·2	0·3	0·5	1·8	3·4
28	0	0	6·7	8·3	4·6	5·3	0	0	7·0	7·4	10·7	10·4	12·4	0·1	6·3	8·9	2·7	5·2	6·4	6·4	1·1	2·6	0·6	0·7
29	1·6	2·0	..	..	3·4	2·1	0	0	9·6	12·4	9·2	12·5	12·8	12·9	4·3	5·4	6·6	5·2	5·3	1·3	1·0	2·8	0	0·8
30	1·8	4·3	..	..	1·1	2·1	1·3	2·1	1·5	0·2	8·9	5·8	9·3	9·4	10·4	10·1	6·4	5·4	4·3	6·2	2·1	..	2·8	5·9
31	0	0	..	..	5·4	4·2	..	..	1·5	..	..	..	9·5	9·9	..	..	..	..	..	..	..	..	..	..

on April 10th. At Kew the buff coloured cardboard has been retained during the whole period.

Table I. gives the amount of sunshine observed at Greenwich for every day in the year side by side with the corresponding amount measured at Kew.

In Table II. the monthly totals of the previous tables are compared. The totals show that for the whole year the excess in the number of hours the sun shone at Kew over the number at Greenwich amounted to 170·8.

TABLE II.—Monthly Totals.

Months.	Greenwich.	Kew.	Greenwich — Kew.	Months.	Greenwich.	Kew.	Greenwich — Kew.
	hours.	hours.	hours.		hours.	hours.	hours.
January	18·7	38·7	—20·0	July	167·3	183·5	—16·2
February	36·4	72·5	—36·1	August	158·6	203·7	—45·1
March	99·3	101·1	— 1·8	September ..	105·6	133·3	—27·7
April	71·8	74·9	— 3·1	October	101·1	120·2	—19·1
May	147·1	140·5	+ 6·6	November....	56·6	81·3	—24·7
June	267·1	223·2	+43·9	December....	27·0	54·5	—27·5
				Year	1256·6	1427·4	—170·8

It will be seen, however, that Kew is not always more sunny than Greenwich, for in the two months, May and June, the latter place was favoured with the greater amount of sunshine. A comparison of the values day by day indicates at once that the differences are not due to instrumental causes, for in that case it might be expected that the excess would always be in one direction. A probable source of the variation suggested itself in *the direction of the wind*, and, therefore, the observations have been distributed into nine columns, accordingly as the wind blew during the whole or greater part of the day from a fixed point of the compass, or was variable in direction. The detailed tables are not given here, but the following are the totals for each direction:—

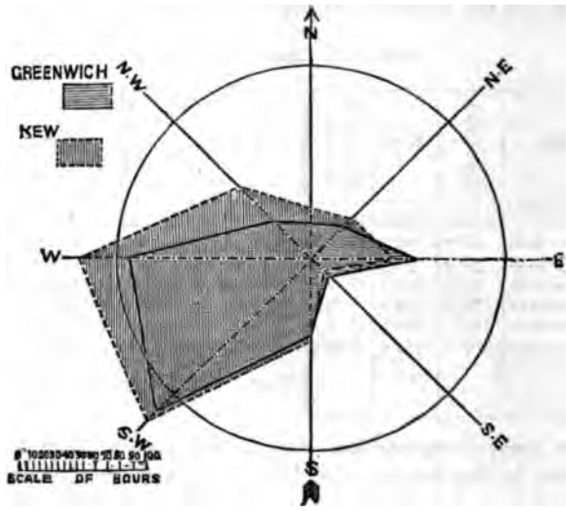
TABLE III.

Wind blowing from	Greenwich.	Kew.	Wind blowing from	Greenwich.	Kew.
	hours.	hours.		hours.	hours.
N	54·7	77·7	SW	357·0	382·1
NE	82·3	91·4	W	303·2	375·7
E	159·6	129·8	NW	87·3	165·7
SE	29·2	18·9	Variable	33·0	33·6
S	122·5	131·1			
			Totals	1228·8	1406·0

This table is represented as a diagram in Fig. 1, where the number of hours of sunshine are laid off on lines representing the direction of the wind,

and their extremities joined. Taking the area of the closed figures so formed to represent approximately the total number of hours of sunshine during the year, the area of the circle drawn round them represents approximately the time during which the sun was above the horizon for the period.

FIG. 1.



Duration of Sunshine distributed according to the direction of the Wind. The area of the circle represents the total number of hours during which the sun was above the horizon.

The differences in Table III. and also in the figure show a decided effect produced by the wind's direction, but as the relative frequency varies in the case of each wind, with a view of obtaining the true proportion, we have expressed in the following table the Kew results as percentages of Greenwich.*

TABLE IV.—Greenwich = 100.

Wind.	Kew.	Wind.	Kew.
N	142	S	107
NE	111	SW	107
E	81	W	124
SE	65	NW	189
Variable 102.			

The above exhibits most clearly the effect of the position, with respect to the metropolis, of the two observatories. Greenwich, lying to the south-east of

*The totals differ slightly from those given in Table II., certain days of doubtful record having been struck out on both sides.

the chief part of London, and having also large manufacturing establishments on its northern side, is greatly shaded by cloud, probably in a great measure due to smoke, when the wind blows from the W, NW or N, whilst Kew, which is situated to the west of London, and is remote from factories and shipping, enjoys a larger percentage of sunshine with those winds. With winds from the NE, S and SW, Kew has but slight advantage over Greenwich, the percentage being respectively 111 and 107. With E and SE winds the London smoke is driven over Kew, and its presence in reducing the transparency of the air is evident in the diminished amount of sun recorded, the quantities being only 81 and 65 per cent. of those registered at Greenwich. The latter percentage for SE wind, being virtually derived from only two days' observations, must not be taken as conclusive.

Fig. 2 (p. 206) shows the relative amount for Kew for each direction, the circle representing Greenwich as unity.

With a view of determining to what extent this distribution of sunshine is influenced by the material used at Greenwich for registration, the following three tables have been drawn up :—

TABLE V.

Register Slips—White Cardboard.

Wind.	Greenwich.	Kew.
	hours.	hours.
N	3·7	9·3
NE	0	0
E	0	0
SE	0	0
S	8·1	9·7
SW	2·9	6·5
W	21·3	41·6
NW	8·9	32·0
Variable	0	0
Total	44·9	99·1

This table shows a great preponderance in favour of Kew, the total being doubled. The chief part of this must undoubtedly be due to the instrument.

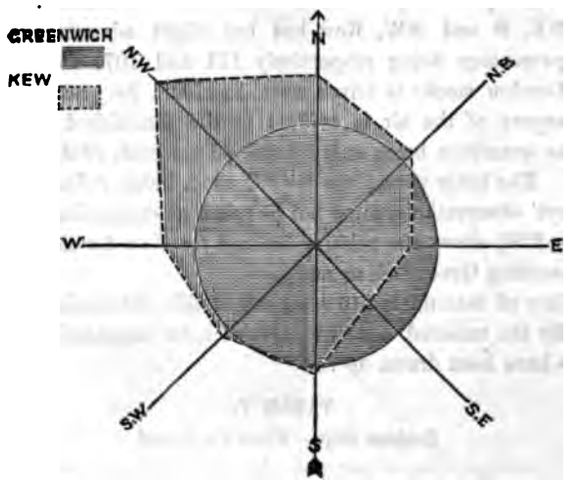
TABLE VI.

Register Slips at Greenwich—Black Cardboard.

Wind.	Greenwich.	Kew.	Greenwich = 100. Kew.
	hours.	hours.	
N	14·5	16·9	116
NE	5·4	3·8	70
E	0·6	0·6	..
SE	6·6	2·7	41
S	43·0	40·3	94
SW	14·3	16·3	114
W	29·3	26·9	92
NW	9·0	14·0	155
Variable	8·5	11·3	133
Total	131·2	132·8	..

From this table we see that with these registers the results are accordant on the total, and the percentages indicate generally the same distribution of cloud with wind. The percentage with variable winds, however, would appear to show a balance in favour of the Kew register.

FIG. 2.



Relative amount of Sunshine at Greenwich during 1877.

In the next table, which includes all observations since April, the percentages follow closely those of the mean table.

The difference under variable winds would nevertheless seem to point out that the Greenwich slip is somewhat better for burning than the Kew one, hence all the values of the latter may be assumed to stand a small quantity too low.

TABLE VII.

Register Slips at Greenwich—Black Millboard.

Wind.	Greenwich.	Kew.	Greenwich = 100. Kew.
	hours.	hours.	
N	36·5	51·6	141
NE	76·9	87·6	114
E	159·0	129·2	82
SE	22·6	16·2	72
S	71·3	81·1	114
SW	339·8	359·3	106
W	252·6	307·2	121
NW	69·4	119·7	172
Variable	24·5	22·3	91
Total	1052·6	1174·2	..

In Table VIII. the totals of Table III. are each divided by the number of days of observation, giving the average daily duration of sunshine under each wind direction.

TABLE VIII.

'age daily duration of Sunshine under each Wind Direction. [From Table III.]

Wind.	Greenwich.	Kew.	Wind.	Greenwich.	Kew.
	hours.	hours.		hours.	hours.
N	2·5	3·5	SW	3·8	4·1
NE	2·9	3·3	W	3·8	4·8
E	5·7	4·6	NW	2·0	3·9
SE	3·6	2·3	Variable	3·0	3·0
S	2·6	2·8			

PROCEEDINGS AT THE MEETINGS OF THE SOCIETY.

May 15th, 1878.

Ordinary Meeting.

CHARLES GREAVES, M.Inst.C.E., F.G.S., President, in the Chair.

LFRED JOHN HENRY CRESPI, B.A., M.R.C.S., Lundy Island, Instow, N. Devon;
ev. DAVID LAMPLUGH, The Hill, Langport; and
iss EMMA ANNE DYMOND, 3 Manston Terrace, Exeter,
balloted for and duly elected Fellows of the Society.

he following Papers were read:—

On the Daily Inequality of the Barometer."* By W. W. RUNDELL, F.M.S.

Meteorology of Mozufferpore, Tirhoot, for the year 1877." By CHARLES 'EARSON, F.M.S. (p. 186.)

te on the Great Rainfall of April 10th to 11th, 1878, as recorded at the Royal Observatory, Greenwich." By WILLIAM ELLIS, F.R.A.S.

eemed to me that it might be useful to communicate to the Society some iculars concerning the great rain of April 10th to 11th last, as experienced ie Royal Observatory.

ain commenced to fall on April 10th, at about 5 p.m., and, according to the registering gauge of Osler's Anemometer, fell moderately until shortly after night: the fall then became more rapid, and, excepting a little slackening after 7 a.m., was most rapid from 1.40 a.m. to 9.25 a.m. of April 11th, veen which times (by Osler) 1·75 in. were recorded: the rain during this od was remarkable for its steadiness, about 0·25 in. being regularly recorded ach hour (by Osler) with scarcely any variation. After 9.25 a.m. the rain lerated somewhat, but continued to fall more or less violently until 1.40 p.m.

following are the particulars of the fall, as given by the several gauges ted in different positions at the Observatory; that obtained from the gauge ly established on the Police Ship 'Royalist' being also added:—

* This Paper will be printed in the next No. of the Quarterly Journal.

Gauge.	Self registering gauge of Osler's Anemometer.	Second gauge at Osler's Anemometer.	On the roof of the Octagon room.	On the roof of the Library.	On the roof of the Photographic Thermometer shed.	Gauge partly sunk in the ground.	At the Police Ship "Royalist," in Blackwall Reach.
Above sea level, in feet	206	206	193	177	165	155	17 above river
Above the ground, in feet	51	51	38	22	10	on ground.	....
1878.	In.	In.	In.	In.	In.	In.	In.
Between Apr. 10th, 5 p.m. and April 11th, 9 a.m.	1·942	2·168	1·886	2·114	2·271	2·289	2·400
Between Apr. 11th, 9 a.m. and Apr. 11th, 1.40 p.m.	0·481	0·474	0·428	0·640	0·504	0·535	
Total	2·423	2·642	2·314	2·754	2·775	2·824	2·400
No. for reference	1	2	3	4	5	6	7

Direction of Wind, E to ENE.

The amount of rain registered at the 'Royalist' is usually less than that recorded on the ground at the Royal Observatory.

I thought that it would be interesting to contrast the preceding results with those of the great fall of 1867 (July 26), and I add herewith the particulars of that fall.

The 'No. of gauge' refers to the numbers at the foot of the preceding table :—

1867.	No. of Gauge.						
	1	2	3	4	5	6	7
	In.	In.	In.	In.	In.	In.	
Between July 25th, midnight, and July 26th, 10 a.m.....	1·838	1·931	2·222	2·617	2·806	3·183	Not established until 1876.
Between July 26th, 1.40 p.m., and July 26th, 10 p.m.....	0·044	0·053	0·236	0·396	0·384	0·483	
Total	1·882	1·984	2·458	3·013	3·190	3·666	....

Direction of Wind, NE to N.

In the 1867 fall, the rain ceased from 10 a.m. on July 26th until 1.40 p.m.; but in 1878 the fall was continuous.

It will be remarked that on these occasions the direction of the wind was not very greatly different, NE to N in 1867, and E to ENE in 1878. The velocity was generally somewhat under or somewhat over 15 miles per hour, excepting on the afternoon of July 26, 1867, when it reached 25 miles per hour. But whilst the fall at different elevations varied considerably in 1867, there was comparatively little variation in 1878. Calling, in each case, the total amount recorded by the gauge No. 6 (on ground) = 100, the ratios at the different elevations are as follows :—

Year.	No. of Gauge.						
	1	2	3	4	5	6	7
1867.	51	54	67	82	87	100	..
1878.	86	94	82	98	98	100	85

Considering the general similarity of the wind, these differences seem remarkable. And the two separate measurements made in each fall show that the distinctive characteristics, of near equality in 1878 and great variation in 1867, are generally maintained through each fall.

The very small amounts registered at the higher elevations in the second portion of the 1867 fall may be due to the higher wind already noticed.

In regard to the comparative magnitude of the two falls:—In the 1867 fall, 3·183 in. were recorded by the ground gauge in 10 hours. In the 1878 fall (as already mentioned), 1·75 in. were registered by Osler's gauge in 7h. 45m., out of a total fall by Osler of 2·423 in., or 72·2 per cent. If the proportion were the same at the ground gauge, we should have 2·824 in. × 0·722 = 2·039 in., for the fall on the ground in 7h. 45m. in 1878, against 3·183 in. in 10 hours in 1867.

The receiving surface of the gauge No. 1 is rectangular, 10 inches by 20 inches: those of the other gauges are circular; the diameter of No. 2 = 10 inches; of Nos. 3, 5, 6, and 7 = 8 inches; and of No. 4 = 6 inches.

ADDENDUM.

Since the preceding Note was communicated to the Society another instance of somewhat remarkable rainfall has occurred. The particulars are as follows:—

Rain commenced to fall at 5.30 p.m. on May 7 (1878), and continued falling until 9.30 a.m. of May 8. The amounts registered in the various gauges are given in the annexed table.

1878.	No. of Gauge.						
	1	2	3	4	5	6	7
May 7th,	In.	In.	In.	In.	In.	In.	In.
5.30 to 6. 0 p.m.	0·076	..	..	..	..	..	..
6. 0 „ 6.15 „	0·250	..	..	..	..	..	..
6.15 „ 6.21 „	0·250	..	..	..	..	..	..
6.21 „ 6.28 „	0·250	..	..	..	..	..	..
6.28 „ 6.50 „	0·250	..	..	..	..	..	..
6.50 „ 9. 0 „	0·212	..	..	..	..	..	..
Total to 9 p.m.	1·288	..	..	..	..	1·394	..
May 7th, 9 p.m., to May 8th,		..	..	..	..	..	..
9.30 a.m.	0·312	..	..	..	..	0·424	..
Total	1·600	1·632	1·735	1·931	1·846	1·818	1·030
Ratios (Ground Gauge = 100.)..	88	90	95	106	102	100	57

Until 2 a.m. of May 8 the wind was variable between NW and NE: it then settled about W.

At 6 p.m., when the heaviest part of the fall began, the wind was NW, changing gradually to NE by 6.50 p.m.

It is thus seen that by Osler's self-registering gauge (No. 1), of the whole quantity registered 0·50 in. fell in 13 minutes (6h. 15m. to 6h. 28m.), and 1·00 in. in 50 minutes (6h. to 6h. 50m.), equivalent to $1{\cdot}00 \times \frac{1394}{1288}$, or 1·082 in. in 50 minutes at the ground gauge.

The great difference observed in this case at the 'Royalist' (gauge No. 7) is probably due to local variation in so rapid a fall.

From the commencement of the rain until 9 p.m. the velocity of the wind averaged about 5 miles per hour; between 9 p.m. and 2 a.m. it varied from 1 or 2 to 5 or 6 miles per hour, and after 2 a.m. averaged about 11 miles per hour.

It may be desirable to state more accurately than is done in the preceding Note, the velocity of the wind in the other cases of great rainfall (1867, July, and 1878, April). Between 1867, July 25, at midnight, and July 26, at 10 a.m., the velocity averaged 16 miles per hour: between July 26, 1.40 p.m. and 10 p.m., it averaged 23 miles per hour. Betwee 1878, April 10, 5 p.m. and midnight,

the velocity averaged 17 miles per hour, and between midnight and 9 a.m. of April 11 averaged 14 miles per hour: afterwards the velocity diminished gradually, being at the end of the rain, at 1.40 p.m., about 9 miles per hour.

The particulars referring to the heaviest portion of each fall are, for the purpose of contrast, collected in the following table :—

Period of heaviest fall.	Amount collected		Ratio at Osler (amount on ground = 100.)	Wind.	
	At Osler, No. 1.	On Ground No. 6.		Direction.	Average hourly velocity.
	In.	In.			
1867. July 25th, midnight, to July 26th. 10 a.m.	1·838	3·183	58	Varied between NE and N.	16
1878. April 11th, 1.40 a.m., to 9.25 a.m.	1·750	2·039	86	Varied between E and ENE.	14
1878. May 7th, 6 p.m., to 6.50 p.m.	1·000	1·082	92	Varied between NW and NE.	5

" Observations of Sea Temperature at slight Depths." By Captain Warren F. Caborne, F.M.S. (A Letter to Captain H. Toynbee, F.R.A.S.)

I have to inform you that shortly after leaving Plymouth I began taking observations with Messrs. Negretti and Zambra's Deep Sea Thermometer, the instrument at the time working well; and annexed will be found the results obtained. Before commencing to record temperatures, I invariably soaked the instrument for some time, and compared it with one of the surface thermometers, never using it until the two agreed. This I found to be very necessary, as wood, being a non-conductor of heat, the shield took some time to lose the temperature which it had previously attained, and until such temperature had been lost the readings were incorrect. It was likewise my custom to repeat the process of comparison upon concluding my observations for the day.

On October 8th, 1877, I found that the mercury in the tube would not unite, and that in consequence the thermometer was useless. At the time I was unable to account for this, and I was much puzzled, more especially as it was in thorough working order when last used on 15th September. During the interval that had elapsed between the two dates, the instrument had been *lying in a flat position*; it will be seen that the mercury breaks when the thermometer is lying flat.

Upon arrival at Wellington, I consulted with Commander Edwin, R.N., the Government Meteorologist, and he, like myself, could not understand what was the matter, but we agreed that it might be a good plan to hang the thermometer *bulb down* for a few days, which was done, with a favourable result, as the mercury again united. When the column of mercury in an ordinary thermometer is broken, it will often be found to be a very difficult process to make it reunite, and it would appear to be particularly so with regard to the deep sea thermometer, owing to the sharp breaking neck, should the separation be allowed to continue for a lengthened period. My experience would therefore tend to show that the thermometer, when not in use, should invariably be kept *bulb down*, in order that the mercury may remain connected.

I think it would be well to invariably use a slip-line for guiding the instrument into the water.

With attention to these little details, I look upon Negretti and Zambra's invention as a great success—the simplicity of its action is in itself a recommendation of great value.

I have recorded depths by Massey's Patent Sounding Machine, with an additional 7-lbs. lead attached, as the ordinary lead is much checked by the wooden shields of the thermometer.

August 29th, 1877, lat. 45° 3′ N, long. 11° 45′ W, tried Negretti and Zambra's deep sea thermometer, ship sailing at the rate of from 2 to 3 knots, depths registered by Massey's Patent Sounding Machine. Temperature of surface by No. 1684, 65°·9; by deep-sea thermometer 66°; 22 fathoms 65°; 22 fathoms 64°·8; 26 fathoms 59°·8; 35 fathoms 57°·8; 38 fathoms 57°·8; 45 fathoms 56°·2; 47 fathoms 56°.

For the first	22	fathoms	thermometer	fell	0°·045	per	fathom.	
26	fathoms	for next	4	„	„	1·25	„	
35	„	„	9	„	„	0·222	„	
38	„	„	3	„	„	0	„	
45	„	„	7	„	„	0·228	„	
47	„	„	2	„	„	0·1	„	

It would appear, therefore, that although the temperature decreases as we get to greater depths, yet the steepest gradients of temperature as regards this upper stratum, are to be met with between 22 and 26 fathoms.

August 30th, lat. 44° 5′ N, long. 12° 15′ W, calm to 1 knot.

Surface by No. 1684, 68°; by deep sea thermometer 68°·1; 17 fathoms 67°·8; 25 fathoms 63°·8; 37 fathoms 61°·8; 45 fathoms 57°·5; 54 fathoms 57°.

17	fathoms	for first	17	fathoms,	thermometer	fell	0°·306	per fathom.
25	„	next	8	„	„	„	0·5	„
37	„	„	12	„	„	„	0·166	„
45	„	„	8	„	„	„	0·538	„
54	„	„	9	„	„	„	0·056	„

Sept. 4th, lat. 34° 39′ N, long. 18° 55′ W, ship sailing 3 knots.

Surface by No. 1684, 75°·3; by deep sea thermometer 75°·5; 9 fathoms 74°; 23 fathoms 72°·9; 31 fathoms 67°·7; 42 fathoms 63°·8; 48 fathoms 61°·8; 66 fathoms 59°·2.

9	fathoms	for first	9	fathoms	thermometer	fell	0°·166	per fathom.
23	„	next	14	„	„	„	0·079	„
31	„	„	8	„	„	„	0·65	„
42	„	„	11	„	„	„	0·354	„
48	„	„	6	„	„	„	0·333	„
66	„	„	18	„	„	„	0·144	„

The steepest gradients are between 23 and 31 fathoms.

Sept. 14th, lat. 11° 53′ N, long. 23° 55′ W, 11 a.m. Used deep sea thermometer, speed 1 to 2 knots, surface by No 1684, 80°·9; by deep sea thermometer 81°·1; 8 fathoms 80°·1; 9 fathoms 80°·1; 10 fathoms 74°·2; 15 fathoms 70°·4; 16 fathoms 72°·2; 19 fathoms 76°; 25 fathoms 74°·9.

By these observations it will be seen that there is a cold stream underlying the surface stratum, which in its turn overlies a warmer stratum. These streaks or strata of temperature are probably closely connected with the strong current ripples we are experiencing to-day.

Same day, 5.30 p.m., lowered a boat, and used thermometer. Surface by No. 1684, 79° 8; by deep sea thermometer 80°; 9 fathoms 80°; 22½ fathoms 75°·2; 27 fathoms 70°; 97 fathoms 54°·6.

Sept. 15th, lat. 10° 32′ N, long. 23° 46′ W, sailing 1 knot. Surface by No. 1684, 80°·9; by deep sea thermometer 81°·1; 9 fathoms 80°·2; 14 fathoms 80°·2; 19 fathoms 77°·8; 24 fathoms 80°; 30 fathoms 70°·9; 30 fathoms 71°; 47 fathoms 71°·2; 90 fathoms 55°·8.

These observations show a cold vein of water below 14 fathoms, which in its turn is above a warmer.

The Meeting was then adjourned.

JUNE 19th, 1878.

Ordinary Meeting.

CHARLES GREAVES, M.Inst.C.E., F.G.S., President, in the Chair.

JOHN CAPEL PHILIPS, J.P., The Heath House, Tean, Stoke-on-Trent; and
W. STEPNEY RAWSON, Drayton House, West Drayton,
were balloted for and [illegible]

The FOREIGN SECRETARY read the following letter :—

THE SECCHI OBSERVATORY ON THE STELVIO.

The President of the Meteorological Society, London.

Moncalieri, April 25th, 1878.

Amongst the many titles which adorned the name of the late illustrious R. Father Angelo Secchi, there was also that of having been one of the first to give an efficacious impulse to the rapid progress which meteorology has made in Italy during the last ten years.

It was he who, in the year 1852, was the first in our country to put forward the great ideas which the American Matthew Fontaine Maury published about nautical meteorology, which gave origin to the adaptation of the electric telegraph to the warnings of storms; and Father Secchi jointly with M. Fabri Scarpellini adapted it, though in very moderate proportions, in the Papal State in the year 1856, one year before the late Le Verrier, Director of the Observatory of Paris, had organised it throughout Europe on a much more extensive scale. In the year 1863, he began the periodical publication of the meteorological notice of the Observatory of the Roman College, in which he collected several important works of his own and other meteorologists.

He supported by his advice and work the direction of the meteorological service which the Government initiated in Italy in the year 1865, and he always protected the Meteorological Alpine Apennine Correspondence, which I, jointly with the Alpine Club, have established, and he wished to be represented in that scheme by the lofty Observatory of Montecavo, which jointly with that of Grotta Ferrata he had just then established in Lazio.

It was therefore a duty that Italian meteorology should solemnly testify its gratitude to the great man who did so much for its benefit.

Commander Lewis Torelli, senator of the kingdom, and Father Francis Denza, Director of the Observatory of Moncalieri, thought of it. The former had inaugurated the meteorological service in Italy in the year 1865, when he was Minister of Agriculture and Trade; the latter had established, nearly at the same time, the Italian Alpine-Apennine Meteorological Correspondence.

They think of naming after Father Secchi the high Meteorological Observatory on the Stelvio, established in the year 1872 by the Valtellina Station Alpine Club, initiated by the same Torelli, who is the president of it.

This thought could not be more seasonable and convenient in order to connect indissolubly the name of the Father Secchi with Italian meteorology.

In fact, the Observatory of the Stelvio is in every way quite peculiar and important. It and the other of the Colle del Valdobbia are at present the two highest sentinels that continually explore not only the atmosphere of our country, but of the whole of Europe, being both at the elevation of more than 2,500 metres above the level of the sea. It is besides the most advanced post which meteorology has on the North of Italy, and overlooks the most frequented passes that from Switzerland and Austria lead to our country.

Besides, the Stelvio Station represents not only the meteorology of the Alps, but of the whole of Italy, inasmuch as it takes part both in the Alpine Apennine Meteorological Circuit and Meteorological Official Service, which it was of late joined to, conjointly with the other two of the Colle del Valdobbia and Little St. Bernard; indeed, it is like an image of the meteorology of all Europe and the globe, for at the last international meteorological meetings these peculiar mountain stations were declared of a general interest for the meteorology of the world, being considered an integral portion of the whole international meteorology which extends from the poles as far as the Equator.

It is for this reason that no Italian Observatory but that of the Stelvio could more seasonably be adorned with a name so dear to science, and though it is a very modest homage, it is nevertheless under every scientific aspect the most seasonable one we can make to the venerated memory of the eminent Italian meteorologist.

Torelli's proposal has just now been approved by the Direction of our Valtellina Station Alpine Club, which was the first to extend the study of meteorology of

our mountains, and the decision was communicated to me last night by the vice-president and secretary of the same station.

Therefore the Observatory of the Stelvio will be for the future called *The Secchi Observatory on the Stelvio;* and this name, which is already so illustrious for so many reasons, will be no more separated from the acts of Italian meteorology, and will be extended every where to the two hemispheres.

P. F. DENZA.

It was proposed by MR. SCOTT, seconded by DR. MANN, and resolved :—

"That the Society has heard Padre Denza's communication with great interest, and that it is sincerely gratified to learn that the name of Padre Secchi will be permanently connected with the progress of Italian Meteorology."

The following papers were read :—

"On the Auroral or Magnetic Cirrus." By the Rev. SAMUEL BARBER, F.M.S. (p. 191.)

"Contributions to the Meteorology of Natal." By ROBERT JAMES MANN, M.D., F.R.A.S. (p. 173.)

"Note on the Mean Relative Humidity at the Royal Observatory, Greenwich." By WILLIAM ELLIS, F.R.A.S. (p. 194.)

"On a method of sometimes determining the amount of the Diurnal Variation of the Barometer on any particular day." By the HON. RALPH ABERCROMBY, F.M.S. (p. 198.)

"On the relative Duration of Sunshine at the Royal Observatory, Greenwich, and at the Kew Observatory, during the year 1877." By GEORGE MATHEWS WHIPPLE, B.Sc., F.R.A.S. (p. 201.)

"The Climate of Lundy Island." By ALFRED J. H. CRESPI, B.A., M.R.C.S., F.M.S. (Abridged.)

LUNDY Island from its geographical position might be expected to have a mild, damp-climate, with cool summers and warm winters, and a small diurnal range of temperature, and so no doubt it has, although certain local circumstances, in addition to its peculiar configuration, make the climate remarkably inclement, windy and unpleasant. The island runs nearly due north and south, having an extreme length of 4 miles, and a breadth varying from 200 yards to 1,600 or 1,800; the area is not exactly known, but is variously given as from 900 to near 3,000 acres: survey, however, gives over 1,000 acres for the 'top' of the island, and the 'sidelands' are fully as extensive, thus the area is from 1,600 to 2,000 acres. It is extremely difficult to convey to a stranger any conception of the appearance of the island—there is a nearly flat table-land or 'top' running due north and south, having an altitude of 450 feet, and neither falling below 400 nor exceeding 509; shelter there is none, every current of wind sweeps the whole table-land. Now from the edge of this table-land the ground slopes away to the sea; sometimes the descent of the sideland is extremely abrupt, at other spots more gradual, while the sidelands are deeply cut by caves, precipices, small bays and glens. The southern and western sidelands are bare, bleak, and precipitous, the northern and eastern covered with rich soil, green, and fertile. The edge of the table-land is rather over 9 miles in circuit. The island itself consists, except at its northern points, of granite with deep basins filled with peat or water, and always swampy: little of the island is drained; even in midsummer the bogs are unpleasant, and the sidelands are slippery and wet. All round the island the water is deep, indeed not less than 80 to 120 feet deep a few hundred yards off, while the currents are formidable, and in a residence of sixteen months I have never known the sea calm all round the island at the same time. At times the island is entirely inaccessible, and it is at no time particularly easy to

approach the rocks. These preliminary observations seem to me of moment as throwing light upon the unpleasant climate of the place, the elevation, exposure, and dampness of the 'top' sufficiently accounting for the feeling of piercing cold for which, according to my experience of Lundy, no other place in the south of England can be more remarkable.

As I think that much light is always thrown on climate by the productions of a given place the following comments on the produce of Lundy, corrected by practical gardeners long resident here, are most significant, and to practical horticulturists will convey volumes. No attempt is made to grow wheat; this is attributed to the lightness of the soil by the managers of the island, as much however, is due to damp wind, and cold. Fruit of all descriptions is a lamentable failure, and if it escapes spring frosts and storms, ripens imperfectly and has a poor flavour; timber of course hopelessly fails: just a few shrubs doing well in the villa gardens; the latter are the gardens of the Squire's residence, and are 300ft. high in a deep and sheltered valley, the largest on the island, but even they are severely cut by easterly gales, though escaping all others; some few roots and green garden crops do pretty well, and are more remarkable for size than quality. Spring is extremely late, according to the Rev. Hudson Heaven, the son of the proprietor, fully a month after Barnstaple; broken weather sets in early. No doubt in a favourable season the gardens and fields would be as forward as the valleys of North Devon were it not for the winds, but they keep everything back. Potatoes answer very badly, being small, watery and peculiarly liable to the disease. Altogether it will be clear that Lundy is no gardener's paradise, even the grass being cut and burnt, while the heather is parched and torn by the winds, and flowers late and badly.

The *one* drawback of the place is the wind; it makes the fine days miserable, even at midsummer it is impossible to keep warm, and this is not a peculiarity of any year, but obtains more or less in all seasons, while, when the temperature falls below 45° the feeling of cold is greater than anything I have felt in frosts with the thermometer at 20° or even lower; indeed, I may say that in the past sixteen months I have felt the cold more than in the preceding sixteen years. But when gales occur, as they generally do at short intervals, the force of the wind becomes incredible. The Trinity House men complain of the winds as almost worse than anything they have experienced in any part of the world. That the wind is really the bane of the place may be shown by this illustration—that often, when at my residence, it was unpleasant to be out of doors for a minute, and when, in spite of the thermometer marking 54° and even 65° in the shade, hands and feet were soon blistered, on walking to the villa, the only house on the island sheltered in a small combe, I have found the family sitting out on the terrace, and the air calm and balmy; indeed it was just like going from midwinter to midsummer. But as no climate can be so execrable as not to have some redeeming features, I must admit that at long intervals we have days so calm, clear, warm, and lovely as to remind one of a semi-tropical latitude; from sunrise to sunset the sky will be a pale blue, a silvery haze resting on the water, and hardly a ripple stirring the sea; but these days generally tell of a furious gale at hand, and though I speak of their being warm the thermometer is not actually high, on one of these days not exceeding 47°, and seldom 60°, but so brightly does the sun shine and so still is the air that the weather is really perfect. The most remarkable of these days were June 18th, with a maximum of 74°, July 27th, 64°, August 4th, 69°, September 4th, 57°, November 5th, 59°, December 18th, 48°, January 11th, 41°, and January 30th, 42°: such days are never seen in winter on shore, at least in my experience, in any part of England.

Next to the winds the fogs deserve attention; it would be difficult to estimate the number of foggy days, nor would any mere statement that there was mist or fog convey any idea of a true drenching Lundy fog As the men at the gun battery have to be certain that the *whole* of the island is entirely concealed, and *that the fog descends to the water*, there are many foggy days on which no firing takes place. Fogs are rare with northerly or easterly winds, at any rate until they have lasted some days, but very common, dense and drenching, when the wind is from the west or south-west; they sometimes occur with the wind blowing a moderate gale, and often accompany rain: at all seasons of the year they are generally drenching; dry fogs are rare.

Rainfall.—This is undoubtedly heavy although irregular. I cannot pretend to estimate it accurately; however, I should place it between 40 and 50 inches.

Humidity—This is most remarkable: on fine days the fall of a few degrees of temperature causes a marvellous precipitation of dew, and in the morning, more particularly in summer, the grass and the ground often look as though there had been drenching rain. Clothes and linen not worn for 36 hours generally get damp and steam when held before a fire. Summer and winter this state of things obtains, except in sharp east winds, when the air is very considerably drier.

The prevailing winds are from the west and south, the most biting from the north-east, and the lowest temperatures accompany those from the north and north-west.

From November to April or May the minima are decidedly high, while the maxima are perhaps above the average, but from May to November the maxima seem low; it must be remembered that the two past winters have been everywhere mild, hence I cannot tell how low the thermometer may fall in severe seasons; in the past twelve years the pools have, it is said, been in two winters frozen for many weeks, once for six weeks. Persons on the island state that in hot weather in North Devon the maxima are from 10° to 14° lower on Lundy, and in cold weather they are here quite as much higher: my own observations do not confirm the latter assertion. I had considerable difficulty in finding any place for my thermometers where they would be freely exposed, sheltered from the direct and indirect influence of the sun, and not shaken by the wind. My attempts were not quite successful, and thermometers were several times torn away by the wind. I need hardly add that there is no shed that will answer for the purpose. Although I cannot claim very much for my thermometric readings, they are probably the only ones that have ever been made here having the slightest claim to exactness and care. The readings were taken at 8 a.m. by myself, and the thermometers are as much sheltered from the sun and as freely exposed as my unfavourable surroundings would admit.

February and March are said to be the coldest, and August the hottest months. From all I can learn probably the mean temperature of the year reaches 50° or even 51°, though the two past winters have been the mildest known here for twelve years—the winter may reach 43° and the summer 57° or 58°, but beyond the latter I do not believe the temperature rises.

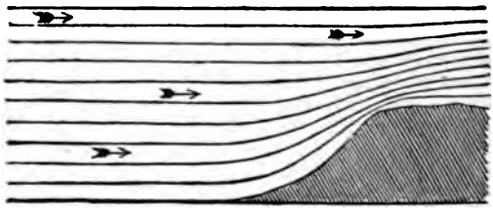
DISCUSSION.

Mr. LECKY was surprised to hear such a gloomy account of Lundy Island, for it was so near to North Devon, which enjoyed the most beautiful climate in Europe. He had made about forty or fifty voyages past the island, but had not noticed a very heavy sea round it except in heavy gales. He believed that the climate was something like that of Valencia, except that Valencia was very rarely visited by fog, while Lundy seemed to be as a rule enveloped in it; this was no doubt caused by the large quantity of fresh water warm from the land discharged by the Severn passing near it, the red colour of which frequently extends beyond Lundy.

THE PRESIDENT (Mr. Greaves) remarked, that Lundy Island was noticeable for the prevalence of fog, and would have been, if accessible, a very desirable station for the study of clouds, which might be continually seen taking their birth and beginning to rise from the sea level in its neighbourhood. There had at one time been a chance of a telegraph to the island, but that had now failed. He would nevertheless recommend the place and its neighbourhood to any one wishing to study the "formation," "suspension," and progress of clouds which might be watched from the mainland on the Devonshire coast, and followed up by railway in their progress under the westerly winds across the country. The constancy of fog at certain seasons was evident from the continuous firing necessary at the gun battery, this being the method of warning adopted when the land and lights were obscured, as described in Mr. Crespi's Paper. The lights, which are two extremely bright ones, and standing on the top of the island, are visible in clear air to a great distance. There is but one landing-place, and that is often inaccessible, so that a visitor is liable to be long a prisoner. There is a general description of the Island written by Mr. Chanter, of Barnstaple. It lies about 16 miles from Clovelly, and 12 miles from Hartland

Point, to which it is exactly opposite; but, except in respect of this oppor it affords for the frequent study of cloud formation, possesses but little in either in the animal or vegetable world.

Mr. SYMONS said that the tremendous force of the wind at Lundy no doubt be partly accounted for, as there was not only the ordinary win the deflected current caused by the wind striking against the side of the land, which would sweep up, and add its force to that due to the hori layer of the altitude of the table-land.



Mr. LAUGHTON thought that the strength of the wind might in great m be accounted for by the peculiar trend of the coast line on each side. A at the map would show that it formed a funnel. All westerly and south-we winds striking the coast to the southward of Hartland Point, or north-we winds from the neighbourhood of St. Ann's Head, must converge on I The island is a table-land, 500 feet high: the winds sweep over it with bu loss from friction. Such reasons as these, added to that which Mr. Symon just mentioned, would probably be sufficient to explain the exceptional st which had been described.

Mr. R. CURTIS said that two years ago he spent the month of Aug Rhosilly, close to the Worm's Head, on the Welsh coast, from which Lundy is distant nearly 20 miles in a SW direction. The formation of the at Rhosilly is something like that of Lundy on a smaller scale—a tabl rising abruptly from the sea—and it is as fully exposed to the full fo the SW and W winds, but, although a decidedly breezy spot, it was stormy as Lundy had been described, and was quite free from fog and whilst corn, of which a great deal was being grown, was quite ripe. Gen Lundy Island was plainly visible, but he had remarked the frequency with it was obscured by mist compared with other parts of the North Devon which were still more distant.

"Notes on some remarkable Cloud Formations, accompanying sudden frequent changes of Temperature and Wind." By Captain WI WATSON, F.M.S.

MARCH 1st, 1878, 2 to 3 p.m., W by S wind falling light, and nimbi gat from SW to NW; at 3 p.m. the sky completely overcast, and rain commer 3.45 p.m. clouds lifting in the SW, and sky clearing; 4·30 p.m. wind sud backed to the S, and freshened to force 4, the temperature going up t 5 p.m. wind unsteady between S and WSW, force 3 to 4. At this time th was clear in the southward, with the exception of cumulo-stratus low do SW horizon and a few streaks of cirrus between that and the zenith; but a of dense nimbi extended from W to NE, about 5° above the horizon reaching to within 8° of the zenith, when it became lost in cirro-stratu cirrus; from 5 to 6 p.m. portions of cloud appeared to be torn from the part of the arch, and after being whirled about from 20 to 40 secoonds join original cloud or vanished. On many occasions these had the appearance upper parts of water-spouts; at one time, 5.30 p.m., I counted five, each defined, and these remained in sight for 4 minutes, but I could not discov traces of agitation on the water beneath them.

Some of these clouds—detached—had a very curious and marked appea one moment being of a grey colour, the next deep black. There was very rain falling, as the clouds under and beyond the nimbus could be distinctly

At 6 p.m. the S wind appeared to be in the ascendant, the sky cleared overhead, and the clouds, cumuli, moved up from the SSW—the upper part of the bank of nimbi was driven to the N, but it never sank below an altitude of 55°. It became densely packed, and had the appearance of masses of black smoke being whirled about by a dozen different forces; the lower part did not change its form, but the incipient water-spouts were more numerous, and the other portions of cloud torn from the larger mass more fantastic in form and motion. At 6.20 the nimbi commenced to rise, and in a very short time had reached the zenith. At 6·30 the wind shifted to W by S, and fell quite light, rain commenced falling, and in 15 minutes the whole sky was overcast—7 to 8, wind hauling to the N, force 1, temperature 51°. At 9 p.m. a squall from SSW—force 8—very heavy rain, temperature rose to 58°. At 9.20 the rain became very cold, with a few hailstones, found the temperature of rain 38°·5; my bulb at the same time marked 49°; the moment the rain ceased the dry-bulb went up to 55°. 9·45, wind light, and bearing to the W; 10.30 p.m. wind W, force 1, with showers of rain; midnight, wind NW, 1, rain.

During the time the wind was veering and backing between SSW and NNW, the dry bulb thermometer several times rose and fell between 48° and 58°; this was not due to any difference in the sea temperature, but to alternate gusts of warm and cold air, as we were evidently on the dividing line of the equatorial and polar currents.*

The following are the positions of the ship, the 'Algeria.'

Noon, lat. 47° 07′ N, long. 39° 18′ W, wind W by S, force 5, nim. and cir-s 9 bcqr
4 p.m. lat. 46° 52′ N, long. 40° 12′ W, wind WSW, force 2-3, nim. cir.-s. d.
8 p.m. lat. 46° 35′ N, long. 41° 14′ W, wind N, force 1, nim. 10 r.

"Account of the Atmospheric Disturbance, encountered by the ship 'Renown,' in lat. 21° N, and long. 25° W." By JOHN HAYDON CARDEW, Messrs. Green's ship 'Renown.'

[Communicated by William Ellis, F.R.A.S.]

ON January 23rd, 1877, while off Madeira, with easterly winds prevailing, some very vivid forked and chain lightning was observed, the weather being very gloomy, but the barometer not unusually low, and on the 25th at 9 a.m. we were struck by a violent squall, accompanied with vivid forked lightning and loud thunder: after this we had strong breezes with a high and confused sea running, and constant forked and chain lightning, the sun rising very stormy.

On January 27th, during the day we had little or no lightning, but at 6 p.m. the appearance was very threatening in the east, with constant brilliant chain lightning and distant rumbling thunder; 7.30 a heavy squall passed across our port quarter, lit up by a constant blaze of forked lightning, the clouds dividing in every direction, both with and against the wind, we at the same time experiencing very little wind. At 8 p.m. the lightning was very grand, hardly an interval between the flashes, which were very close and vivid—of all the colours of the rainbow, and followed by deafening crashes of thunder overhead. At 12.30 a.m., a furious squall was observed coming up from the eastward, it could be heard roaring along the surface of the water like an avalanche. At 12.40 it struck the ship with terrific violence, making it necessary to let go the topsail and keep before the wind. The only thing to which I can liken it is to a terrific broadside from all the men-of-war of a whole fleet; the blaze of the lightning, the continued deafening thunder, combined with the roar of the wind and rain, made such a scene of confusion as I have never before seen. The chain lightning was now continuous, and the air became so hot and sultry, that the decks in a short time were quite dry, and the air seemed to sparkle and crackle all around. 2.15, the lightning had now increased to a dangerous extent, both forked and chain, and also ball, and the thunder was very deafening. The wind was falling light and the rain commencing to fall. 3.30, calm with heavy rain and the lightning terrific, the

* Note by Captain Toynbee.—After receiving Captain Watson's log, I found that these remarkable changes were followed by a NW gale. At 4 p.m. 2nd, in 45° 4′ N, 45° 48′ W, the wind was WNW to NNW 9, with very heavy snow squalls; temperature of the air 21°·5′; of the sea, 37°. In six hours the sea was up to 51°, but the air remained below 30° from 8 a.m. 2nd to noon 3rd.

whole heavens ablaze, the air seemed literally to be on fire, as many as five or six flashes going on at the same time, of all the colours of the rainbow. 3.45, we now saw two flashes which eclipsed every other, they were ball lightning, known as thunderbolts ashore, and were close to the deck, each flash being of long duration, followed by such a crash of thunder, which combined with the *awful* proximity of the lightning took away the power of sight and hearing for some seconds. The captain and myself experienced a shock as from a galvanic battery. I do not believe a Woolwich infant would make such a noise as those two peals, even if fired off close by. It was now raining heavily, and from 4 to 6 continued as bad as ever, but after that gradually subsided, and by 9 a.m. had completely ceased.

Throughout the disturbance the barometer fluctuated very little, but a high cross sea was met with from January 22nd to 28th.

The Meeting was then adjourned.

Donations received from July 1st to September 30th, 1878.

Presented by Societies, Institutions, &c.

Adelaide	Observatory	Meteorological Observations, January to December, 1877.
	,, ,,	Rainfall in South Australia, April and May.
Batavia	Magnetisch en Meteorologisch Observatorium.	Bijdrage tot de Kennis der Weeragesteldheid ter Kuste van Atjeh door Dr. P. A. Bergsma.
Berlin	K. Preussische statistisches Bureau.....	Preussische Statistik, XLVII.
Brisbane.....	General Registry Office..	Report on the Vital Statistics, April to May.
Brussels	Observatoire Royal.....	Bulletin Météorologique.
	,, ,,	Annales Météorologiques, March and April.
	Société Belge de Géographie	Bulletin. Tome II. No. 3.
Budapest	K. Ung. Central-Anstalt für Meteorologie und Erdmagnetismus.....	Jahrbuch, 1876.
Calcutta	St. Xavier's College Observatory	Meteorological Register, July 1877 to June 1878.
Christiania....	Norske Meteorologiske Institut	Oversight over Veirforholdene i Norge i Aaret 1877.
Copenhagen ..	Danske Meteorologiske Institut	Bulletin Météorologique du Nord, June 1 to August 31.
Cordoba	Oficina Meteorológica Argentina	Anales. Tomo I. Clima de Buenos Aires.
Cracow	K. K. Sternwarte.....	Meteorologische Beobachtungen," June to August.
Fiume.....	I. R. Accademia di Marina	Meteorological Observations, May and June.
Hamburg	Deutsche Seewarte.....	Wetterbericht.
Iowa	Weather Service	Weather Bulletin, March to July.
	,, ,,	Second Annual Report, 1877.
Lisbon	Academia Real das Sciencias	Memorias, Classe I. Tome V. Parte 1.
	,, ,,	Jornal de Sciencias Mathematicas, Nos. 17-22.
	,, ,,	Relatorios das sesioes solemnes, 1875 e 1877.
	,, ,,	Curso de Meteorologia. Por Capt. A. A. de Pina Vidal.
	,, ,,	Tratado Elementar de Optica. Por Capt. A. A. de Pina Vidal.

London	General Register Office ..	Weekly Return of Births and Deaths, Nos. 26-38.
	,, ,,	Quarterly Return of Marriages, Births and Deaths, June 30.
	,, ,,	Annual Summary of Births, Deaths, and Causes of Deaths, 1877.
	India Office	Madras Meteorological Observations, 1851-1855.
	Meteorological Office	Daily Weather Reports.
	,, ,,	Weekly Weather Reports, Nos. 20-32.
	,, ,,	Hourly Readings, October 1877.
	,, ,,	Quarterly Weather Report, 1875. Part 3.
	,, ,,	Meteorological Observations at Stations of the Second Order, 1877. Part 1.
	,, ,,	The Meteorology of the Atlantic during August, 1873, with Charts.
	,, ,,	Degree of Accordance between the Plates in Quarterly Weather Report and the Readings from Photographic Curves.
	Royal Astronomical Society	Monthly Notices. Vol. XXXVIII. No. 8.
	Royal Society	Proceedings, Nos. 188 and 189.
	Society of Arts	Journal, Nos. 1337-1349.
	Society of Public Analysts	The Analyst, Nos. 28-30.
Madrid	Sociedad Geográfica	Bóletin. Tome II. No. 6; IV., 2-5.
Melbourne	Observatory	Monthly Record of Results of Observations in Meteorology, Terrestrial Magnetism, &c., December, 1877, to May, 1878.
Mexico	Ministero de Fomento ..	Boletin, Tomo II., Nos. 56-61, 63-93; III. 1-25.
	,, ,,	Revista Meteorológica Mensual, February to May.
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THE END.

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REPORT

ON THE

METEOROLOGY OF ENGLAND

FOR THE YEAR

1878,

WITH

MONTHLY ABSTRACTS OF OBSERVATIONS MADE AT THE STATIONS

OF THE

METEOROLOGICAL SOCIETY.

BY

WILLIAM MARRIOTT,

Assistant-Secretary.

rt on the *Meteorology of England for the Quarter ending* MARCH 31st, 1878, *with Monthly Abstracts of the Observations made at the Society's Stations*. By WILLIAM MARRIOTT, Assistant-Secretary.

ɔSPHERIC PRESSURE was very high, and not subject to much change ıg the quarter.

January the mean reduced to sea level was above 30·1 in., the highest · 30·2 in.) being in Devonshire, and the values decreasing towards the north-

A large anticyclone passed over England on the 11th-13th; on the 11th he 12th the pressure at all the stations was above 30·6 in., and at some ıs exceeded 30·7 in.; the maximum reported being 30·734 in. at 9 a.m. he 12th at Buxton. The minimum pressure occurred at most of the ɔns on the evening of the 24th or morning of the 25th, the lowest being 80 in. at 9 a.m. on the 25th at Ramsgate.

ı *February* the mean pressure was above 30·2 in., and exceeded of January by more than 0·1 in., and at several stations even)·2 in. The maximum readings occurred on the 21st or 22nd, at western and southern stations. *e.g.* 30·696 in. at 9 p.m. on the 21st at rchstoke. A depression passed to the northward of these islands on 27th-28th, when the minimum was recorded at all the stations, the lowest g 29·604 in. at 9 p.m. on the 27th at Wakefield.

ı *March* the mean pressure was still above 30·0 in., but was less uniform in the two preceding months; the mean was highest in the south-west lowest in the north-east. The maximum recorded was 30·717 in. at n. on the 16th at Buxton, and the minimum 29·128 in. at 9 a.m. on 29th at Ramsgate.

R TEMPERATURE was on the whole high, there being no severe weather he latter part of March.

January the mean temperature* was 39°·5, and the figures varied from n the Midland Counties to 42° at the western sea-side localities. The ıerature, excepting from the 10th to the 12th, was high till the 24th, ı colder weather set in, and continued till February 12th. The mum was attained at nearly all places on the 21st, the highest reports ; 57°·9 at Llandudno and 57°·8 at Hereford; but readings of 50° and e were recorded at most of the stations on the 14th, 15th and 26th. minimum temperature took place at the various stations on the 11th, , 25th, 27th or 30th, the lowest readings being 18°·0 at Buxton on the , and 20°·0 at Audley End on the 11th. The mean daily range for the e of the stations was 8°·8.

February the mean temperature was 40°·9, the lowest, 39°, occurring e Midland District, and the highest, 43°·7, at the western sea-side places. weather set in on the 18th, and continued till March 12th. The maxi-, with one exception, occurred on the 17th, the highest readings being

* The mean of the 9 a.m. and 9 p.m. readings.

63°·4 at Llandudno, and 62°·8 at Wakefield. The minimum took place in the west on the 1st, in the south and east on the 8th, and in the north on the 9th, the lowest reports being 21°·6 at Shrewsbury on the 1st, 21°·8 at Audley End on the 8th, and 23°·6 at Buxton on the 9th. The mean daily range for all stations was 9°·7.

In *March* the mean temperature was 40°·8, or 0°·1 below that of the previous month, and varied from 38°·0 at Buxton to 43°·7 at Llandudno, and 43°·6 at Babbacombe. The weather was rather cold from the 13th to the 17th, warm from the 18th to the 21st, and cold during the remainder of the month. The maximum occurred on various dates at different stations, but chiefly on the 1st, 2nd, 3rd and 7th, the highest entries being 60°·0 on the 1st at Wakefield, and 59°·5 on the 3rd at Norwood. The minimum took place on the 14th in the west, on the 17th in the south, and on various dates in the other districts; the lowest values recorded were 21°·9 at Cheadle on the 26th, and 22°·8 at Hillington on the 28th. The mean daily range for all stations was 12°·4.

A remarkably sudden squall occurred on the 24th, in which H.M.S. 'Eurydice' was lost, and was accompanied by a very rapid fall of temperature from the maximum to the minimum. This squall has already been discussed elsewhere (see 'Symons's Meteorological Magazine,' April), but it is interesting to give the highest and lowest readings on that day at our various stations with the range of temperature, viz.:—

	Max.	Min.	Range.		Max.	Min.	Range.
	°	°	°		°	°	°
Audley End	45·1	26·2	18·9	Kelstern	46·2	26·6	19·6
Babbacombe	45·8	33·9	11·9	Llandudno	44·1	32·6	11·5
Buxton ...	37·1	26·5	10·6	Mansfield.....	43·1	26·0	17·1
Carmarthen	46·0	31·1	14·9	Marlborough	46·1	27·7	18·4
Cheadle ...	41·2	24·9	16·3	Norwood	45·6	25·9	19·7
Churchstoke	40·9	27·2	13·7	Ramsgate.....	45·5	27·8	17·7
Dartmoor ...	36·4	29·0	7·4	Shrewsbury	40·6	23·7	16·9
Hereford ...	43·1	26·8	16·3	Strathfield Turgiss	45·1	27·1	18·0
Hillington	44·8	26·6	18·2	Wakefield	40·6	26·7	13·9

RAINFALL.—In *January* the total rainfall as well as the number of rainy days was small in the southern districts, but large at Buxton, where a depth of 8·55 in. was measured on 28 rainy days. The least amount was 0·99 in. at Norwood. The greatest fall in one day, 1·44 in., occurred at Buxton on the 18th.

In *February* the number of rainy days was small, but the fall was more evenly distributed over the country than in the previous month, the total falls varying from 0·87 in. at Wakefield to 2·92 in. at Carmarthen and 5·49 in. at Dartmoor, where the rainfall is always large. The greatest fall was 1·46 in. at Dartmoor on the 28th.

In *March* the rainfall was in many cases less than an inch; very little rain was recorded from the 1st to the 24th. The total falls varied from 0·49 in.

at Mansfield and 0·67 in. at Hillington to 3·33 in. at Buxton and 4·55 in. at Dartmoor. The greatest falls were 1·68 in. at Dartmoor on the 1st, and 1·20 in. at Babbacombe on the 28th, the latter being the result of a severe snowstorm.

WIND.—In *January* the wind blew chiefly from SW to N, but not with much force, as it only exceeded 7 on one or two occasions at a few places, while calms were frequent. During *February* the prevalent direction of the wind was from between S and W and only at two places reached a moderate gale. In *March* the general direction of the wind was from between W and N, and blew with greater force than in the two previous months, gales occurring at most of the stations, while calms were less frequent.

NOTES BY THE OBSERVERS.

BABBACOMBE, *January* was a dry month; no rain was measured from the 8th to the 19th, inclusive, 12 days. The ground was covered with snow on the 25th, when a bitterly cold NW wind blew, and the minimum temperature, 29°·3, occurred between 3 and 4 p.m., followed by a glazed frost, and then by a thaw. The temperature was variable, being warm in the first week, and from the 13th to the 22nd, and cold in the second week, and after the 23rd.

February.—This has been another dry month as regards the rainfall, though the humidity of the air has been considerable. No frost in the air, snow, hail or gales occurred. Cold polar winds and very high barometer prevailed till the 9th; generally mild, damp weather, with equatorial winds or calms then prevailed till the end of the month, accompanied by a very high barometer, viz. 30·685 in. on the 21st. The mean barometer reading was remarkably high, and the weather very cloudy and gloomy.

March.—This month has been remarkably dry, only 0·10 in. of rain being registered on the 25 days ending on the 26th, and no measurable rain falling in the 13 days from the 10th to the 22nd, inclusive. More than half of the total rainfall occurred on the 28th, 1·20 in. in a severe snowstorm and NE gale, lasting from 10·30 p.m. to 11 a.m. on the 29th. The snow did not lie on the ground here, but covered all the inland districts, especially Dartmoor, to a great depth, and remained there till the end of the month. NW winds generally prevailed. Winter seems to have begun here at the spring equinox; it was very mild till the 12th, and from the 18th to the 21st; cold during the rest of the month.

DARTMOOR, *March 28th.*—Soft snow fell at intervals during the day. About 4 p.m. it became colder, and snow fell steadily. Wind rose during the night (snow continuing), was about 9 at 9 a.m. 29th, and increased to whole gale by noon. All communications stopped; drifts very high. Impossible to realise the quantity of rainfall, as rain gauge was covered with between 4 ft. and 5 ft. of snow; other parts of lawn over 8 ft., and parts nearly clean. Wind fell about 4 p.m. and continued to decrease, until at midnight it was quite calm.

Abstract of Meteorological Observations for the Month of JANUARY, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of					Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.														
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.														
Wakefield	30·104	39·8	40·5	40·2	35·4	45·2	25·2	30	57·0	21	38·4	38·8	89	86	7·3	6·9	2·34	·64	3	16	2	3	14	0	3	0	1	1	4	8	19	4	22
Kelstern	·105	36·9	36·8	36·9	33·8	42·0	22·8	25	53·9	21	36·3	36·4	95	96	6·7	6·1	2·38	·55	27	24	7	2	11	0	8	3	1	1	4	17	14	13	1
Mansfield	·144	37·7	38·0	37·9	35·2	44·0	24·0	30	55·2	21	36·9	37·3	93	93	5·3	4·8	1·97	·46	27	19	5	6	5	0	7	1	0	1	4	12	14	6	17
Buxton	·143	37·5	37·8	37·7	34·0	42·2	18·0	30	51·8	21	36·3	36·6	89	90	8·5	8·6	8·55	1·44	13	23	7	1	21	0	7	7	2	0	0	2	18	21	5
Cheadle	·144	37·8	38·6	38·2	35·3	41·5	24·0	25	53·2	21	36·9	37·6	92	91	7·8	7·8	3·24	·77	27	21	5	2	19	1	12	3	2	2	8	6	14	11	4
Llandudno	·126	42·5	43·2	42·9	39·6	47·4	28·0	25	57·9	21	40·7	41·2	86	85	7·9	6·7	2·71	·45	27	18	2	3	17	3	8	4	3	1	7	7	28	4	0
Shrewsbury (Leaton)	·152	38·9	39·9	39·4	35·3	44·2	22·0	30	55·0	21	37·8	38·9	90	91	7·1	6·7	1·85	·56	27	19	5	3	14	0	9	1	2	1	2	2	17	12	16
Churchstoke	·170	39·2	39·9	39·6	35·2	44·7	25·0	30	54·2	21	38·1	38·7	91	90	6·8	6·2	1·72	·41	27	13	4	4	11	2	3	3	0	2	2	7	21	9	15
Hereford	·162	40·4	41·2	40·8	36·8	46·1	24·9	30	57·8	21	39·0	39·8	89	89	7·1	6·1	1·48	·57	27	16	2	1	14	0	2	2	0	0	1	8	11	9	29
Carmarthen	·186	42·9	42·1	42·5	38·6	47·7	24·5	11	55·1	15	41·8	41·3	91	93	6·7	6·1	3·65	·66	27	21	1	5	14	0	6	0	1	1	4	12	8	9	21
Dartmoor	·228	38·0	38·0	38·0	34·6	42·2	25·0	12	48·6	22	37·5	37·6	95	96	8·1	7·2	5·75	·78	21	20	4	4	19	4	1	11	0	1	1	14	5	18	11
Babbacombe	·222	42·1	42·1	42·1	38·6	47·2	24·4	12	54·8	15	40·7	40·7	89	89	6·8	7·0	1·85	·57	27	12	3	4	17	4	8	6	0	0	4	11	15	11	7
Marlborough	·192	38·5	39·5	39·0	35·6	45·0	25·3	30	54·7	21	37·9	38·9	95	95	7·4	7·5	1·90	·49	27	16	2	4	19	0	3	1	2	0	2	8	22	7	17
Strathfield Turgiss	·185	39·6	40·0	39·8	35·0	45·0	21·7	12	54·1	22	38·1	38·7	88	90	6·2	6·3	1·12	·35	3	12	1	7	14	0	5	3	2	1	4	12	14	6	15
Norwood	·174	39·1	39·7	39·4	35·7	44·5	24·4	11	55·1	21	37·8	38·3	89	89	7·3	6·7	·99	·30	28	15	4	5	17	0	7	6	1	1	5	6	18	10	8
Ramsgate	·149	39·8	40·2	40·0	36·2	44·2	28·2	27	53·2	22	38·4	38·5	89	86	7·0	6·8	1·90	·79	28	12	6	1	12	1	4	6	1	2	2	18	14	7	8
Audley End	·132	38·3	38·1	38·2	34·2	44·0	20·0	11	56·2	22	37·4	37·3	93	93	7·1	6·5	1·70	·38	27	19	7	3	12	0	5	0	0	2	1	16	6	20	12
Hillington	30·099	37·7	38·2	38·0	33·6	43·8	21·3	11	55·4	15	37·0	37·5	94	94	7·5	8·0	2·06	·37	27	19	3	2	16	1	4	8	1	2	3	22	7	12	3
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

Phenomena observed at the Stations during JANUARY, 1878.

DATE.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Wakefield	...	...	●	●	●	●	●	●	...	...	...	●	●	●	...	..	...	...	...	●	●	●	●▲K	●	*	...	●*	...	...	...	...
Kelstern	●	...	●≡	●≡	●≡	●	●	*▲	●*	●*	●≡	...	●	●	●	...	...	●≡	●≡	...	●	●≡	*	●	*	*	*	●≡	...	●	▲
Mansfield	●	●	●	●≡	≡	●	●	●	*	●	...	...	●	●	●	...	...	≡	●≡	●	●	●≡	*	*	*	...	●*	...	...	...	...
Buxton	●	...	●	●≡	●≡	●	*	*	*	...	...	●	●	●	●	●	●	...	●≡	●	●	●	●*K	*	*	●	●*	●	≡	≡	...
Cheadle	●	...	●	●	●	...	●*	*	*	...	...	...	●	●	●	●	●	●	●≡	●	●	●	*	●	●	...	●*	●	...	..	...
Llandudno	●	...	●	...	●	●	●	...	...	...	...	●	●	●	...	...	●	...	●	...	●	●	●	*	*	●	●	●▲	...	...	...
Shrewsbury (Leaton)	≡	≡	●	≡	●≡	●	●*	●	...	...	...	●	●	...	...	...	●≡	●≡	●≡	●	●	●≡	●*	*▲	*	●≡	●≡	●*	...	≡	...
Churchstoke	...	...	●	...	≡	●	●	...	...	...	...	...	●	●	...	...	...	...	●	●	●	●	●*▲	*	●*	*	●	●	...	...	...
Hereford	≡	●≡	●	≡	●≡	●	●	..	...	...	≡	≡	●	...	...	...	●	≡	●≡	●≡	●	●	●*	●	*	●≡	●	...	...	..	≡
Carmarthen	●	●≡	●	...	●	●	●	...	...	...	...	●	●	●	...	...	●	...	●	●	●	●	▲	●	*▲	●	●≡	▲	●	...	...
Dartmoor	●	●≡	●≡	≡	●≡	●≡	*	...	...	...	...	≡	●≡	●≡	≡	●≡	●≡	≡	●	●≡	●≡	●≡	*<	●	*	●	●≡	*	...	...	...
Babbacombe	≡	...	●≡	...	●≡	●	●	...	...	...	...	...	...	...	...	...	...	≡	≡Ψ	●	●	●	●*▲K	●○	●*	...	●≡	●*	...	...	...
Marlborough	...	●≡	●	●	●≡	≡	●	●	...	...	...	...	●	...	...	...	●	●≡	≡Ψ	●	●	●	●*	...	●*	...	●	●	...	≡	≡
Strathfield Turgiss	●≡	...	●	●	●	...	●	...	...	≡	≡	≡	●	...	...	...	...	≡	...	●	●	●	...	...	●*▲	...	●≡	●	..	≡	≡
Norwood	...	●≡	●≡	●	●*≡	...	●	...	*	≡	≡	≡	●	...	●	...	...	●≡	≡	●	●	●	●<	●*	*	...	●≡	●	...	≡	≡
Ramsgate	...	●≡	●	●	●≡	...	●	*▲	●*▲	...	▲	≡	...	...	...	...	...	≡	≡	●	●	...	...	...	●*▲	...	...	●*▲	▲	*▲	*▲
Audley End	●≡	●≡	●≡	●	●	...	●	●*▲	●*	●*	...	●	●	...	●	...	...	≡	≡	●	●	●	▲	*	*	*	●	...	●	...	*
Hillington	●	≡	●≡	●	●	...	●	●▲	●	●	...	...	●	...	●	...	...	...	≡	●	●	●	≡	*	*<	...	●	●	...	...	*

Abstract of Meteorological Observations for the Month of FEBRUARY, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of					Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.														
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.														
Wakefield	30·226	40·6	42·6	41·6	37·8	47·9	26·4	9	62·8	17	39·2	40·7	89	85	7·0	6·8	·87	·34	14	10	1	3	13	0	1	1	1	1	4	13	13	1	21
Kelstern	·243	38·2	39·6	38·9	35·3	45·8	27·1	1	56·1	17	37·7	39·1	95	95	7·1	5·7	1·69	·36	28	16	0	4	12	0	2	0	2	2	10	16	9	12	3
Mansfield	.266	37·8	39·6	38·7	35·8	46·1	24·6	1	58·4	17	37·2	38·8	95	93	6·3	5·6	1·35	·45	12	11	1	5	9	0	0	1	1	2	7	13	10	3	19
Buxton	·253	38·3	38·7	38·5	35·0	43·1	23·6	9	55·0	17	37·1	37·5	90	90	8·4	7·2	2·45	·50	28	15	1	1	16	0	4	1	1	5	0	7	23	11	4
Cheadle	·257	38·7	40·2	39·5	36·1	..	26·7	9	..	..	37·6	39·2	91	92	8·2	6·7	1·81	·43	12	12	1	2	17	2	4	4	4	5	14	12	5	7	1
Llandudno	·207	43·8	43·6	43·7	39·8	49·1	29·3	1	63·4	17	41·7	41·7	84	85	7·5	7·3	1·13	·40	28	11	0	2	16	0	4	2	6	1	14	10	18	1	0
Shrewsbury (Leaton)	·252	39·7	40·8	40·3	36·1	46·6	21·6	1	58·7	17	38·8	39·5	92	89	8·8	6·9	1·01	·24	28	15	1	2	18	0	2	2	2	2	9	3	16	3	17
Churchstoke	·274	40·3	41·2	40·7	36·3	46·4	23·5	1	60·7	17	39·1	39·4	90	85	7·4	6·9	1·06	·27	12	12	1	1	9	0	1	1	4	5	4	12	4	5	20
Hereford	·256	40·4	42·2	41·3	37·2	47·9	24·2	1	57·6	26	39·6	40·7	93	88	8·7	7·7	1·16	·42	12	10	0	2	20	0	0	0	1	2	6	4	4	3	36
Carmarthen	·241	43·1	42·7	42·9	38·8	48·6	23·8	1	59·7	17	42·1	41·9	92	93	8·4	9·0	2·92	·69	28	17	0	0	20	0	0	0	12	3	5	11	3	0	22
Dartmoor	·269	39·4	40·0	39·7	36·1	43·1	23·5	1	54·0	17	39·0	39·6	97	96	8·2	8·7	5·49	1·46	28	17	0	2	21	1	2	4	5	4	7	9	6	3	16
Babbacombe	·285	43·8	43·8	43·8	40·4	48·3	32·2	1	57·5	17	42·6	42·6	91	91	8·4	7·3	2·32	·72	12	12	0	2	18	0	4	4	8	2	5	9	11	4	9
Marlborough	·294	39·7	41·0	40·4	37·4	46·8	24·8	8	57·7	17	39·1	40·3	95	94	8·6	8·3	1·85	·40	27	14	0	2	21	0	2	1	2	1	4	12	5	0	29
Strathfield Turgiss	·310	41·5	41·6	41·6	36·7	47·4	23·0	8	60·6	17	39·9	40·5	87	90	8·1	8·0	1·63	·54	13	12	0	2	18	0	3	1	0	11	11	3	10	2	15
Norwood	·290	40·9	42·2	41·6	37·4	46·9	25·7	8	58·9	17	39·9	40·9	91	89	9·0	7·4	1·21	·37	13	13	0	0	19	0	4	1	6	0	8	12	9	3	13
Ramsgate	·292	41·4	41·8	41·6	38·4	46·2	25·9	8	55·3	17	40·4	40·9	91	92	8·4	6·8	1·20	·33	27	18	0	1	16	0	4	4	5	2	5	18	4	6	8
Audley End	·249	39·8	41·0	40·4	36·0	46·8	21·8	8	60·0	17	39·0	40·0	93	91	7·3	7·0	1·14	·28	13	13	0	3	16	0	0	0	0	5	1	14	2	11	23
Hillington	30·240	39·7	40·9	40·3	35·8	46·7	24·9	8	60·2	17	39·0	40·1	94	93	7·9	7·9	1·37	·33	27	12	0	0	17	0	5	3	1	3	2	25	11	4	2
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

DATE.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Wakefield	...	...	...	...	...	...	...	...	≡	...	●	●	*≡	●	●	...	...	...	...	●	...	...	...	●	...	●	●	●
Kelstern	●	●≡	●≡	...	...	...	...	...	≡	...	●	●ψ	●≡	●≡	●≡	...	●	...	●○	...	...	...	●≡	●≡	●	●≡	●	●
Mansfield	≡	≡	...	...	...	...	...	...	≡	...	●	●≡	●*	●≡	●	...	...	...	●	...	...	...	...	●	●	●	●	●
Buxton	...	≡	...	≡	...	...	...	≡	≡	●≡	≡	●	●*≡	●	●	...	●	●	●	●	●	...	...	●	●	●	●	●
Cheadle	...	...	≡	≡	≡	≡	...	≡	≡	●≡	...	●*	●≡	●	●	...	●	...	●	...	...	...	...	●≡	●	●	●	●
Llandudno	...	≡	≡	...	...	...	...	≡	●≡	●≡	...	●	...	●≡	●	...	●	...	...	...	●	...	●	●	...	●	...	●
Shrewsbury (Leaton)	...	●≡	...	≡	...	...	≡	≡	●	●≡	●≡	●*▲≡	●	●≡	●	●	●	...	...	●	...	...	...	...	●	●	●	●
Churchstoke	●≡	...	...	≡	...	...	...	...	≡	≡	●	●*▲	●	●	●	...	●	...	●	...	...	...	≡	...	●	●	●	●
Hereford	...	...	...	≡	...	...	...	≡	●≡	●≡	≡	●≡	●	≡	●	≡	●	...	●≡	...	...	...	...	...	...	●	●	●
Carmarthen	...	...	...	...	...	...	...	...	●	●	...	●	●	●	●	●	●	...	●	●	...	●	●	●	●	●	●	●≡
Dartmoor	...	●	...	...	...	...	...	...	●≡	●≡	●≡	●≡	●≡	●≡	●≡	●≡	●≡	≡	●	...	●	≡	...	●	●≡	●≡	●≡	●≡
Babbacombe	...	...	...	...	...	...	...	...	●	...	●≡	●	●	●≡	●≡	●≡	●	...	●≡	○	...	≡	○	...	...	●	●	●
Marlborough	≡	●≡	≡	...	...	...	...	≡	●≡	●≡	●≡	●	●	●	●	...	●	...	●≡	...	●	●≡	...	≡	...	...	●	●≡
Strathfield Turgiss	≡	●≡	●≡	≡	...	...	...	≡	●	●≡	●≡	●	●ψ	●	●≡	...	●	...	≡	...	...	≡	≡	≡	...	T	●	●
Norwood	●≡	●≡	●≡	...	≡	≡	≡	≡	●≡	●≡	≡	●≡ψ	●	●	●≡	○	●○	...	≡	...	≡	●	...	...	...	...	●	●
Ramsgate	●	●	●	●	...	...	...	●≡	●≡	●	...	●	●	●	●≡	...	●	...	...	...	●	●	●≡	●	...	...	●	●
Audley End	●	●	●	...	...	...	...	...	≡	●	≡	●	●ψ	●	●	●	●	...	≡	...	...	●	≡	...	...	...	●	●
Hillington	●	●	●	...	...	...	...	≡	●≡	...	...	●	●	●	●	...	...	...	...	...	...	...	...	●	●	...	●	●

EXPLANATION OF THE SYMBOLS.—● indicates rain; * snow; ▲ hail; ≡ fog; ⊼ thunderstorm: T thunder; ≤ lightning; ○ solar halo; ψ lunar halo.

Abstract of Meteorological Observations for the Month of MARCH, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of					Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.														
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.														
Wakefield	30·038	42·2	40·9	41·5	36·4	48·7	26·3	28	60·0	1	39·4	38·4	78	80	5·8	5·1	·76	·19	1	10	7	1	4	1	5	3	1	1	1	7	21	15	8
Kelstern	·031	40·4	37·8	39·1	34·1	47·4	25·9	23	57·0	21	39·2	37·1	90	94	6·7	5·2	1·54	·35	24	16	10	3	9	3	11	5	2	0	2	7	13	21	1
Mansfield	·071	40·2	38·9	39·5	35·6	48·4	25·0	25	58·0	10	38·3	37·5	84	88	5·4	3·9	·49	·13	26	12	8	7	5	0	13	2	0	0	1	10	22	5	9
Buxton	·079	38·7	37·4	38·0	34·1	44·3	23·4	27	52·9	1, 2	37·2	36·0	87	88	6·7	6·2	3·33	·79	1	15	9	1	12	0	12	7	5	0	0	3	13	22	0
Cheadle	·068	39·3	38·7	39·0	34·0	46·1	21·9	26	52·5	2	37·4	36·9	85	85	5·9	5·9	1·20	·20	1	15	7	4	8	10	16	6	1	4	3	8	7	17	0
Llandudno	·090	44·6	42·9	43·7	39·5	49·1	31·4	14	55·2	21	41·4	40·2	77	80	7·2	6·9	1·85	·59	1	15	7	2	15	1	9	9	5	1	0	2	26	10	0
Shrewsbury (Leaton)	·097	41·8	40·2	41·0	35·4	48·2	23·7	24	56·8	1	39·5	38·5	82	86	6·3	6·7	·94	·18	28	14	9	3	12	1	14	2	4	0	0	1	21	11	9
Churchstoke.....	·115	40·7	39·9	40·3	35·2	47·0	25·3	14, 15, 25	56·4	1	38·5	37·9	82	84	6·5	6·3	·91	·21	1	9	9	2	11	0	8	6	4	0	1	3	14	17	9
Hereford	·097	42·5	41·2	41·9	36·1	49·0	26·1	14	56·8	1	39·9	38·9	80	82	6·6	6·2	·77	·19	24	13	6	2	11	0	5	6	0	0	0	2	9	14	26
Carmarthen	·125	44·6	41·8	43·2	38·0	51·0	26·8	14	57·9	7	42·6	40·8	85	92	7·3	6·9	2·04	·27	1, 5, 23	17	6	2	15	0	21	2	4	1	0	7	6	11	10
Dartmoor	·141	39·0	37·9	38·5	34·0	43·3	24·5	30	48·8	2, 7	37·6	37·0	88	92	7·2	6·0	4·55?	1·68	1	16	7	1	12	3	7	10	3	0	1	2	10	20	9
Babbacombe	·145	44·9	42·2	43·6	38·3	50·1	26·8	17	58·2	7	41·7	40·1	77	84	6·3	5·5	2·13	1·20	28	9	5	3	10	5	13	7	2	0	0	8	11	17	4
Marlborough	·113	41·1	39·7	40·4	34·9	49·2	24·3	23	56·7	2, 3, 7	39·0	38·1	83	87	6·9	5·8	1·65	·62	28	11	6	4	12	0	7	4	1	0	0	7	12	9	22
Strathfield Turgiss	·097	42·6	40·9	41·7	35·4	50·3	24·0	17	58·5	7	39·7	38·5	78	81	7·6	6·4	1·17	·73	28	8	4	4	17	1	9	6	4	1	0	9	12	17	4
Norwood	·082	41·0	40·8	40·9	35·8	48·9	24·7	17	59·5	3	38·4	37·9	79	78	7·8	5·9	1·11	·50	28	10	8	4	15	4	13	4	1	0	1	7	12	18	6
Ramsgate.....	·050	42·2	41·1	41·7	37·1	48·3	27·8	24	57·4	3	39·7	38·7	81	81	7·2	5·2	2·18	·64	31	16	9	3	9	3	1	8	1	0	0	17	17	16	2
Audley End.....	·034	41·3	39·5	40·4	34·4	48·2	24·2	17	58·2	1	39·0	37·7	82	86	6·5	5·8	1·35	·33	31	15	12	4	12	0	6	6	0	1	0	1	19	38	0
Hillington	30·019	41·6	39·0	40·3	34·7	49·0	22·8	28	57·7	1	39·7	37·6	85	88	7·2	6·0	·67	·11	24	14	9	2	10	2	13	8	0	1	1	7	7	25	0
Columns ...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

DATE.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Wakefield	●	...	...	...	●	●	...	...	...	●	●	...	...	...	...	...	...	...	...	✱	●	✱	...	✱	✱	●	...	...	✱	✱	●✱
Kelstern	●	...	...	...	...	●	...	✱	●	...	●	...	...	●	✱	...	...	...	...	...	●	✱	●	✱	✱	●○	✱	✱	✱	✱	✱▲
Mansfield	●	...	...	...	●	...	...	...	●	●	●	...	...	...	...	...	〓	...	...	...	●	✱	...	✱≺	✱	✱	...	●✱	✱	✱	●✱
Buxton	●	...	...	●	●	●	●	●▲	●	●	●	...	...	...	...	...	...	...	...	●	●	✱	✱	✱	✱	●	✱	✱	✱	✱	✱
Cheadle	●	...	...	...	●	●	●	...	●	●	●	...	...	〓	〓	...	...	〓	...	...	●	...	...	✱T〓	✱	✱	✱	✱	...	✱	●✱
Llandudno	●	...	...	●	●	●	●	...	●	...	●	...	...	...	...	...	●	...	...	...	●	✱	✱	✱▲K	...	●	●	●✱	✱	✱	✱▲
Shrewsbury (Leaton)	●	●	...	...	...	..	...	●	●	...	●	...	...	...	〓	...	...	...	...	〓	...	✱	✱	✱	✱	✱	●〓	✱〓	✱	✱	✱
Churchstoke	●	...	...	...	●	...	...	...	●	...	●	...	...	...	...	...	●	...	...	...	...	...	✱	✱	✱	●✱	✱	✱	✱	✱	✱
Hereford	●	...	...	...	...	...	...	...	●	...	●	●	...	...	...	〓	...	〓	...	...	●	...	✱	✱▲	✱	●	●	✱	✱	✱	●
Carmarthen	●	●	〓	●	●	...	...	...	●	...	●	...	...	...	...	...	●	...	...	...	...	●	✱▲	✱▲	✱▲	●	●	✱	✱	✱	●
Dartmoor	●〓	...	〓	...	●〓	●	〓	...	●〓	...	●	●〓	...	...	...	...	●	〓	...	...	...	✱▲	✱	✱	✱	...	●	✱	✱	✱	●
Babbacombe	●	...	...	...	●	...	...	...	●	○	...	...	...	...	...	...	...	...	...	...	...	...	●○	✱	✱	...	●	●✱▲	✱	✱	●
Marlborough	●	...	〓	...	●	...	...	...	●	...	●	...	Ψ	...	〓	...	...	...	...	...	...	...	✱	✱	✱	●	...	●✱	●✱	✱	●
Strathfield Turgiss	●	...	...	...	...	...	...	...	●	...	...	...	...	〓	▲〓	〓	...	..	...	...	...	...	〓	✱	✱	●	...	●✱〓	●✱	●	●
Norwood	●	...	...	..	○	...	...	...	●	●	●	...	Ψ	○	✱	...	...	...	...	...	...	...	...	✱	✱	✱	✱	●✱	✱	✱	●
Ramsgate	●	●	●	...	...	...	...	...	●	...	●	...	✱▲	●▲	●▲	✱▲	...	●	...	...	...	✱▲	✱	✱▲	●✱	●	✱	●	...	●✱	✱
Audley End	●	...	...	...	...	...	...	...	●✱	●	●	...	●✱	●	✱	✱	...	●	...	...	●	✱	...	✱	✱	✱	...	✱	✱	✱	●✱
Hillington	...	...	●	...	...	●	...	...	●	●	●	●	✱▲	●	...	...	...	●	...	...	●	✱	✱	✱	●✱▲	✱	✱	...	...	✱▲	●✱

EXPLANATION OF THE SYMBOLS.—● indicates rain; ✱ snow; ▲ hail; 〓 fog; K thunderstorm; T thunder; ≺ lightning; ○ solar halo; Ψ lunar halo.

LLANDUDNO, *February 17th.*—Fair, windy and warm: at 2.30 p.m., dry bulb 62°·0; wet bulb 49°·4; humidity 42.

NORWOOD, *January 18th.*—Fine day with fog, very dense from 2 to 4 p.m. (Excessively *dense black* fog in London, especially between 11 and 12.)

March 24th.—Fine till 3.45 p.m., then sudden squall (force 8) and rapid fall of temperature with snow till 5.30 p.m., afterwards fine and bright night.

LIST OF THE STATIONS, WITH THE NAMES OF THE OBSERVERS, &c.

Station.	County.	Lat.	Long.	Height of Ground.	Observer.
Audley End	Essex	52° 1′ N.	0°13′ E.	154ft.	J. Bryan.
Babbacombe	Devon	50 29	3 31 W.	293	E. E. Glyde, F.M.S.
Buxton	Derby	53 14	1 54 W.	987	E. J. Sykes, F.R.A.S., F.M.S.
Carmarthen	Carmarthen	51 52	4 18 W.	188	G. J. Hearder, M.D.
Cheadle	Stafford	52 58	1 57 W.	646	J. C. Philips, J.P., F.M.S.
Churchstoke	Montgomery	52 31	3 5 W.	549	P. Wright, F.C.S., F.M.S.
Dartmoor Prison	Devon	50 33	3 59 W.	1372	R. E. Power, L.R.C.P., F.M.S.
Hereford	Hereford	52 5	2 45 W.	274	T. A. Chapman, M.D.
Hillington	Norfolk	52 48	0 33 E.	88	Rev. H. Ffolkes, F.M.S.
Kelstern	Lincoln	53 24	0 7 W.	388	D. G. Briggs, F.M.S.
Llandudno	Carnarvon	53 21	3 50 W.	79	J. Nicol, M.D., F.M.S.
Mansfield	Notts	53 8	1 12 W.	349	W. Tyrer, F.M.S.
Marlborough	Wilts	51 25	1 43 W.	471	Rev. T. A. Preston, M.A., F.M.S.
Norwood	Surrey	51 26	0 6 W.	184	W. Marriott, F.M.S.
Ramsgate	Kent	51 20	1 25 E.	105	Rev. E. D. O'Gara, O.S.B., F.M.S.
Shrewsbury (Leaton)	Salop	52 45	2 57 W.	266	Rev. E. V. Pigott, F.M.S.
Strathfield Turgiss	Hants	51 20	1 0 W.	195	Rev. C. H. Griffith, F.M.S.
Wakefield	Yorks	53 41	1 30 W.	96	H. Clarke, M.R.C.S., F.M.S.

NOTE ON THE TABLES.

Column 1 is the mean of the readings of the barometer at 9 a.m. and 9 p.m. corrected for temperature and reduced to sea-level.

Column 4 is the mean of the readings of the dry-bulb thermometer at 9 a.m. and 9 p.m.

Columns 5 to 10. The maximum and minimum thermometers are read and set at 9 p.m., and the readings entered to the same day.

Columns 13 and 14. The relative humidity is calculated by dividing the elastic force of vapour at the temperature of the dew-point for the month by that at the temperature of the air (*i.e.* dry-bulb reading).

Columns 15 and 16. The amount of cloud is estimated according to the scale 0—10, 0 representing a cloudless sky, and 10 a completely covered or overcast sky.

Columns 17 to 20. The rain is measured at 9 a.m., and the amount entered to the previous day. A fall of ·006 in. and above constitutes a day of rain.

Column 21. When any snow falls it is entered as a day of snow.

Columns 22 and 23. When the mean of the 9 a.m. and 9 p.m. observations of cloud is less than 2·0, this is called a day of clear sky, but when the mean is above 8·0 it is called an overcast day.

Column 24. When the force of the wind is 7 and above (on the scale 0—12) this is counted as a gale.

Columns 25 to 33 give the sums of the observations of the direction of the wind at 9 a.m. and 9 p.m.

Report on the Meteorology of England for the quarter ending JUNE 30TH, 1878, *with Monthly Abstracts of the Observations made at the Society's Stations.* By WILLIAM MARRIOTT, Assistant-Secretary.

ATMOSPHERIC PRESSURE was a little below the average for the quarter, but was not subject to any great changes.

In *April* the mean, reduced to sea-level, was 29·84 in., which is nearly a quarter of an inch lower than that of March; the lowest being 29·801 in. at Carmarthen, and the values increasing towards the east, especially the north-east and south-east, the highest being 29·888 in. at Gainford. The maximum readings occurred at most of the stations on the 27th; in the east, however, they took place on the 7th, and in the north on the 11th, the highest being 30·321 in. at Churchstoke at 9 a.m. on the 27th, 30·298 in. at Lowestoft at 9 a.m. on the 7th, and 30·282 in. at Gainford at 9 a.m. on the 11th. The minimum occurred at all stations on the morning of the 1st, the lowest reported being 28·964 in. at Gainford.

In *May* the mean pressure was 29·78 in., which is ·06 in. below that of April, and increased from the north-west to the south-east, the lowest being 29·728 in. at Llandudno, and the highest 29·832 in. at Ramsgate. The maximum occurred at nearly all the stations on the evening of the 29th or morning of the 30th, the highest being 30·228 in. at Churchstoke; while the minimum was recorded in the north-west on the morning of the 15th (29·187 in. at Llandudno), and at the other stations on the 24th (29·252 in. at Hereford).

In *June* the pressure was higher and more uniform than in the two preceding months, the mean being 29·94 in., which is ·16 in. above that of May. The reading followed the same order as in the previous month, viz. decreasing from the south-east towards the north-west, the highest being 29·988 in. at Ramsgate, and the lowest 29·903 in. at Llandudno. The maximum occurred at most of the stations on the 6th, the highest being 30·265 in. at 9 a.m. at Babbacombe, while the minimum was recorded at all places on the 11th, the lowest being 29·269 in. at Gainford at 9 p.m.

AIR TEMPERATURE was on the whole a little above the average for the quarter.

In *April* the mean temperature* was 46°·7, being nearly 6° above that of the previous month, and varied from 43°·0 at Dartmoor to 49°·2 at Llandudno. The temperature was low during the first two weeks, but warmer weather set in about the 14th and continued more or less throughout the remainder of the month. The maximum at the different stations occurred on various dates, but chiefly on the 14th, 28th, and 30th, the highest readings being 70°·7 at Llandudno on the 12th, and 67°·9 at Audley End on the 30th. The minimum took place at nearly all the stations on the 1st, the lowest being 17°·2 at Audley End and 20°·0 at Kelstern. The mean daily range for the whole of the stations was 15°·7.

In *May* the mean temperature was 52°·5, or 5°·8 above that of April, and

* The mean of the 9 a.m. and 9 p.m. readings.

varied from 48°·1 at Dartmoor, and 49°·6 at Buxton, to 54°·3 at Norwood, and 54°·2 at Eastbourne. The weather was mild till the 18th, but cold during the remainder of the month, snow falling at some stations on the 20th and 21st. The maximum readings occurred chiefly on the 10th or 12th, the highest being 73°·7 at Hillington on the 12th. The minimum was recorded generally on the 21st, the lowest being 33°·0 at Cheltenham, and 33°·5 at Cheadle and Gainford. The mean monthly range for all stations was, owing to the prevalence of cloud, only 14°·7.

In *June* the mean temperature was 58°·2, or 5°·7 above that of the previous month, and varied from 54°·8 at Dartmoor, and 55°·0 at Buxton, to 60°·5 at Norwood, and 60°·4 at Eastbourne. The weather was cold till the 19th, warm from the 20th to the 29th, and cold on the 30th. The maximum occurred in the south on the 26th, and in the north on the 27th, the highest readings being 89°·1 on the 26th at Strathfield Turgiss, and 93°·0 on the 27th at Llandudno. The minimum readings were registered on various dates, the lowest being 35°·0 at Shrewsbury on the 6th, and 35°·6 at Audley End on the 2nd. The mean daily range for all the stations was 16°·8.

Rainfall was large and variable, several very heavy local falls having occurred. Thunderstorms also were frequent.

In *April* the total rainfall as well as the number of rainy days was small in the eastern counties but large in the south-west, the amount varying from 0·92 in. at Lowestoft with 9 rainy days, to 6·25 in. at Dartmoor and 5·03 in. at Babbacombe, with 25 and 23 wet days respectively. The greatest fall in one day was 1·70 in. at Norwood on the 10th. (This fall was, however, very excessive in the north of London, the large amount of 4·6 in. having been measured at Haverstock Hill in the space of 30 hours.) No rain fell at any of the stations on the 26th and 27th, the only days during the quarter on which rain was not measured at some station.

In *May* the rainfall and the number of rainy days were large, thunderstorms being very frequent. The total falls varied from 9·33 in. at Dartmoor, and 8·14 in. at Downside, to 2·45 in. at Llandudno, the only station from which thunderstorms are not reported. The average number of rainy days was 22. The greatest daily falls were 2·17 in. at Dartmoor on the 16th, and 2·00 in. at Downside on the 10th.

In *June* the rainfall was somewhat variable, owing to local thunderstorms; the total falls varied from 6·05 in. at Dartmoor, and 4·00 in. at Buxton, to 1·08 in. at Lowestoft, and 1·21 in. at Eastbourne. The average number of rainy days was 14. The greatest fall was 1·79 in. at Dartmoor on the 10th. (On the 23rd, during a severe thunderstorm, 3·28 in. fell at Camden Town in less than an hour, while only 0·41 in. was measured at Norwood on the same day.)

Wind.—In *April*, with the exception of the first few days, and from the 14th to the 20th, the general direction of the wind was from E to SE. Gales occurred at a few places, chiefly on the 10th. In *May* the prevalent direction was from the SW to W, the greatest force being from the 15th to the 19th, when it reached 7 at several stations. In *June* the general direction during the early part of the month was from the SW, but NE from the 25th to the 30th. A moderate gale occurred at a few places on the 11th.

NOTES BY THE OBSERVERS.

COMBE, *April*.—This has been a damp, wet, and foggy month; but
e days occurred in the first week and about the 26th. The heaviest
were, as usual, in the spring, accompanied by easterly winds;
fell in the 16 hours from 10 p.m. on the 9th to 2 p.m. on the 10th,
blowing a moderate gale from the E. Sharp frosts occurred in the
ek, after which time the weather was generally warm, moist, and
le to vegetation, which made rapid progress. Easterly winds pre-
l the second and last weeks, and south-westerly during the rest of
th.

—This has been another rainy, damp and cloudy month. Rain,
ıot always as much as ·01 in., fell on every day (with the exception
18th) from the 9th to the 29th. The temperature was about the
; it was generally warm till the 19th; then rather cold, especially so
0th, 21st, 30th, and 31st. Frost on the grass occurred only on two
viz. the 5th and 21st. The barometer was generally low and un-
south-westerly winds prevailed, and blew a gale on the 5 days from
to the 19th.

—The weather was wet, cloudy and generally cold, with variable
ıostly SW, till the 19th; after which date fine, bright, warm and dry
prevailed with NE winds; the latter blowing off the sea prevented
le temperature from rising to such a degree as prevailed inland, so
nly exceeded 70°·0 on 8 days. The air was generally damp. The
er was mostly above the average in the first week, and after the 18th,
the second week. A SW gale blew on the 11th.

RENHAM, *May*.—The early part of the month, with the exception of a
rers and some thunder, was fine and pleasant. A heavy thunderstorm
on the night of the 10th, after which the weather turned to wet:
·oken succession of rainy days, the 23rd alone being excepted,
till the 28th, when a change for the better occurred. Trees very
ighted; leaves falling from some: plum trees especially denuded.

—The early part of the month was wet and ungenial for this time of
, gradually changing however to beautiful weather, till on the 20th
burst of summer came: for the rest of the month the weather was
at times very close, good for ripening fruit.

DUDNO, *June 16th*.—At 4.30 p.m. a heavy sea fog came over the
Orme and from Llandudno Bay, meeting another from the Menai
covering all the hills, the Great Orme and town being perfectly clear
ny. The fog continued in the same way all the evening, otherwise
).

Abstract of Meteorological Observations for the Month of April, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of					Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.														
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.														
Gainford	29·888	47·0	43·9	45·5	38·0	55·1	27·0	5	65·2	14	44·0	42·3	78	87	6·0	..	1·85	·83	20	11	2	..	..	..	..	..	..	..	..	..	..	..
Wakefield	·863	47·0	45·8	46·4	38·8	56·1	27·2	7	65·8	14	44·3	44·1	80	87	7·2	5·5	1·92	1·10	20	12	1	3	9	0	4	5	13	4	1	2	8	2	21
Kelstern	·869	47·5	42·6	45·0	38·4	54·0	20·0	1	62·7	15	46·2	42·2	90	97	6·2	4·5	1·13	·50	20	10	0	7	8	0	1	10	15	12	6	5	7	0	4
Mansfield	·869	46·8	43·7	45·3	38·7	55·8	25·0	1	64·8	29	44·4	42·4	82	90	5·1	3·5	1·53	·61	20	14	1	8	3	0	4	6	11	8	3	7	8	0	13
Buxton	·865	46·5	42·8	44·7	37·2	52·5	28·4	1	60·1	14	43·9	41·3	81	88	6·1	6·2	2·34	·50	20	12	3	4	6	0	2	3	10	14	4	10	8	7	2
Cheadle.....	·840	45·9	44·6	45·2	38·5	54·1	24·9	1	63·8	29	43·0	42·6	79	85	5·9	4·1	2·20	·45	19	14	1	7	6	6	3	7	15	14	6	6	4	5	0
Llandudno	·820	50·6	47·7	49·2	42·7	57·5	34·0	1	70·7	12	47·1	44·9	77	80	6·7	4·5	1·39	·26	3	12	0	4	9	2	4	3	15	15	10	2	10	1	0
Chester	·831	49·6	47·5	48·6	40·1	58·0	29·3	1, 6	67·3	27	45·4	44·4	72	78	4·6	..	1·45	·37	19	14	0	..	..	0	4	4	9	9	22	3	2	4	3
Shrewsbury (Leaton)	·841	47·9	45·3	46·6	37·5	56·8	25·0	1	66·0	28	45·3	43·6	81	87	5·6	2·9	2·10	·59	23	19	1	10	4	0	1	1	9	12	4	4	9	0	20
Churchstoke.....	·864	47·2	45·7	46·5	38·6	55·1	24·2	1	62·5	30	44·2	43·1	78	81	5·8	4·2	1·34	·20	19	18	2	3	1	1	2	8	9	13	4	4	6	7	7
Hereford	·827	47·9	46·6	47·2	39·7	56·6	26·2	1	63·7	30	45·1	44·2	80	82	6·7	3·6	2·32	·76	10	20	0	5	6	0	1	5	12	3	1	3	5	1	29
Cheltenham.....	·828	49·9	46·9	48·4	39·8	57·4	22·4	1	66·0	27, 30	46·1	44·3	74	81	4·6	3·6	3·27	·84	10	18	1	9	4	1	4	3	10	11	8	6	6	6	6
Carmarthen	·801	51·0	46·8	48·9	41·1	57·8	27·9	1	63·9	25	47·9	45·3	79	88	6·8	5·4	3·44	·59	13	18	0	5	12	0	1	1	17	12	7	3	3	2	14
Dartmoor	·812	44·0	42·1	43·0	38·3	48·3	27·6	1	57·0	26	42·6	41·2	89	93	7·8	6·9	6·25	·70	23	25	2	5	19	5	0	3	14	9	9	6	7	6	6
Babbacombe.....	·817	48·1	46·0	47·1	42·7	53·4	31·6	2	59·3	30	46·3	44·7	87	90	7·2	6·3	5·03	1·10	9	23	0	7	16	2	4	9	15	1	6	13	9	1	2
Downside	·820	47·4	45·1	46·3	40·0	54·8	29·1	1	62·9	28	45·3	43·9	84	90	7·0	4·8	3·59	·89	10	19	0	5	9	2	1	8	13	6	2	14	7	1	8
Marlborough	·846	47·7	45·6	46·6	39·4	56·4	25·8	1	65·0	30	45·2	43·9	82	87	6·8	4·2	2·59	·58	10	15	2	6	10	0	0	2	20	2	7	4	14	0	11
Stathfield Turgiss ..	·845	50·1	46·2	48·2	39·4	57·9	27·4	1	65·6	28	46·8	44·6	77	88	6·6	4·5	2·35	·67	10	16	0	5	8	0	3	8	11	3	5	15	7	3	5
Norwood	·851	48·7	46·4	47·5	40·5	56·6	28·2	1	66·6	30	45·9	44·5	80	86	6·4	4·3	4·32	1·70	10	19	1	9	7	0	4	4	19	2	4	5	13	1	8
Eastbourne	·845	48 8	46·9	47·9	42·3	55·0	29·3	1	62·3	25	46·4	45·3	83	88	6·3	4·3	2·79	1·01	10	17	1	6	9	0	5	7	18	3	0	7	9	8	3
Ramsgate	·870	48·0	45·5	46·7	41·7	53·3	29·7	1	65·2	30	45·6	44·0	83	89	6·2	4·5	1·89	·32	23	16	1	5	6	1	5	21	4	2	5	12	2	4	5
AudleyEnd	·840	48·8	45·0	46·9	38·8	57·3	17·2	1	67·9	30	46·2	43·5	81	89	6·5	3·9	1·68	·50	20	12	3	5	7	0	1	8	7	16	1	7	5	7	8
Hillington.....	·845	50·1	44·6	47·3	39·0	57·9	21·1	1	65·6	12	47·1	43·0	79	87	6·5	5·9	1·05	·41	3	6	1	4	10	0	0	7	10	16	4	16	4	3	0
Lowestoft	29·863	47·7	43·7	45·7	40·4	52·3	23·2	1	63·4	15	45·7	43·0	85	94	6·5	4·2	·92	·47	16	9	1	4	6	0	5	6	18	3	6	4	7	1	10
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

EXPLANATION OF THE SYMBOLS.—● indicates rain; ✱ snow; ▲ hail; ☰ fog; ⊼ thunderstorm; T thunder; ≺ lightning; C solar halo; ψ lunar halo.

Abstract of Meteorological Observations for the Month of May, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of				Wind, No. of Observation of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.													
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.													
Gainford	29·769	52·9	48·4	50·6	44·0	59·5	33·5	21	70·0	2, 5	49·5	46·4	78	85	6·9	5·9	4·07	·97	7	17	1	4	7	0	2	7	2	11	8	10	1	5	16
Wakefield	·757	53·3	50·9	52·1	45·2	60·3	36·1	21	69·8	12	49·9	48·4	78	83	7·7	6·2	4·32	·67	6	23	0	1	12	0	5	6	5	5	9	5	12	4	11
Kelstern	·773	53·2	48·6	50·9	44·4	59·5	34·6	21	69·4	18	51·2	47·7	86	93	7·5	5·8	3·44	·43	17	25	0	1	10	0	4	2	9	10	9	16	7	2	3
Mansfield	·767	52·9	50·0	51·4	45·0	61·1	35·8	21	70·0	5	50·5	48·7	84	91	6·7	5·9	4·87	·55	8	23	0	1	6	0	5	2	8	3	8	12	9	1	14
Buxton	·766	51·6	47·6	49·6	43·0	57·4	35·0	21, 30	65·0	2	48·4	45·9	79	87	8·0	6·9	6·08	·51	23	26	0	0	13	0	3	2	8	7	3	12	13	14	0
Cheadle.....	·755	51·5	49·6	50·6	44·0	58·9	33·5	21	66·0	6	49·0	47·7	83	86	6·8	7·3	4·70	·73	7	24	0	1	12	3	2	6	8	7	13	11	10	5	0
Llandudno	·728	55·2	51·4	53·3	48·0	61·9	39·6	21	71·0	12	51·4	49·0	76	84	6·8	5·2	2·45	·31	27	22	1	5	12	0	7	1	10	4	7	6	23	4	0
Chester	·742	55·4	52·5	53·9	46·8	62 0	37·8	21, 30	70·0	12	51·0	49·7	73	81	6·5	5·9	3·48	·61	7	23	0	1	8	2	6	4	3	8	14	14	5	8	0
Shrewsbury (Leaton)	....	54·4	51·1	52·7	44·4	61·4	34·0	21	68·6	12	51·6	49·4	81	88	..	..	4·86	·86	8	23	0	..	..	..	..	..	..	..	..	..	..	..	..
Chu[illegible]stoke.....	·785	53·5	50·8	52·1	45·9	59·3	34·3	21	64·7	11	50·1	48·1	78	82	6·0	6·2	5·15	·72	8	24	0	0	4	0	4	3	5	12	9	21	4	3	1
Hereford	·759	54·3	51·5	52·9	45·9	61·0	35·1	21	67·8	10	51·1	49·3	79	85	8·2	6·6	4·68	·82	10	23	0	1	11	0	1	4	4	1	6	13	4	0	29
Cheltenham	·774	55·7	52·0	53·9	45·8	62·1	33·0	21	70·0	10	52·2	50·0	78	86	6·2	6·5	4·99	1·08	10	24	0	1	4	1	4	1	3	5	9	17	15	5	3
Carmarthen	·750	55·7	50·7	53·2	46·8	61·1	36·2	21	66·0	10	53·0	49·8	82	94	7·5	5·5	4·46	·72	16	23	0	4	11	0	8	1	6	3	5	20	9	4	6
Dartmoor	·790	49·5	46·7	48·1	43·4	53·3	35·8	21	60·8	31	47·9	45·7	88	92	9·0	6·9	9·33	2·17	16	24	0	0	20	3	0	2	8	5	7	16	8	12	4
Babbacombe.....	·797	54·4	50·7	52·5	47·5	59·1	38·2	21	63·9	18	51·3	49·0	80	88	7·6	6·5	4·10	·95	16	22	0	1	15	5	4	5	5	3	7	16	13	7	2
Downside	·777	53·6	50·3	51·9	45·8	59·4	37·1	21	68·1	10	51·4	49·1	85	91	7·5	6·8	8·14	2·00	10	23	0	2	15	1	2	7	1	4	7	24	9	2	6
Marlborough	·801	54·6	51·2	52·9	46·3	62·0	35·3	31	69·8	10	51·8	49·7	82	89	8·4	6·7	4·26	·88	10	22	0	2	16	0	1	1	11	2	7	23	5	0	12
Strathfield Turgiss..	·804	56·6	51·4	54·0	45·7	63·5	36·3	31	72·2	10	53·5	50·2	80	92	7·5	5·8	2·71	·43	10	16	0	1	10	0	1	0	5	3	10	25	9	1	8
Norwood	·804	56·0	52·5	54·3	47·8	63·3	37·6	21	71·6	12	52·0	50·3	75	85	7·6	6·2	3·91	·73	1	22	0	1	14	2	1	4	8	1	9	13	12	3	11
Eastbourne	·824	55·7	52·8	54·2	49·0	61·4	40·5	9	69·9	12	52·7	51·1	81	88	7·1	5·5	3·10	·64	28	20	0	2	9	1	2	6	5	3	3	7	25	11	0
Ramsgate	·832	55·7	52·4	54·1	48·9	60·6	40·5	22	66·6	11	52·5	50·6	80	88	7·3	6·2	3·95	·95	7	23	0	1	9	3	2	10	4	1	5	27	5	2	6
Audley End	·776	56·6	51·3	54·0	46·3	62·8	36·2	31	71·9	2,18	53·0	49·6	78	88	7·6	6·5	3·58	1·00	7	23	0	1	11	0	0	7	1	12	3	23	1	12	3
Hillington	·776	55·9	50·3	53·1	45·5	63·3	37·6	21	73·7	12	52·5	48·8	79	89	8·6	6·8	3·95	1·23	17	23	1	0	14	1	0	10	5	15	5	17	2	8	0
Lowestoft	29·788	54·2	50·9	52·6	47·1	59·6	39·0	22	69·8	18	52·0	49·5	85	90	7·5	5·3	3·23	1·04	8	18	0	2	7	0	3	4	9	5	5	12	20	2	2
Columns.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

Phenomena observed at the Stations during MAY, 1878.

DATE.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Gainford	...	...	●	...	...	●	●	...	...	...	...	●△K	T	T	●K	●	●K	●K	●	●*	●	●	●	...	...	●	●K	●T	...	...	●
Wakefield	●	●	●	...	...	●	●	...	...	●	●	●	●	●	●	●	●	●K	●	●	●△	●	●	...	...	●	●K	●	...	...	●
Kelstern	●T	O	●	...	...	●O	●	...	...	...	●	●△T	●	●△T	●	●	●	●K	●	●T	●T	●	●	●	●	●	●T	...	●	...	●
Mansfield	●K	...	●O	...	...	●	●	●	●	●	●Ψ	●	●	●	●	●	●	●△K	●	...	...	●	●	●	●	●	●	●	...	...	...
Buxton	T	●	●	...	...	●	●	●K	●	●	●	●	●	●△K	●	●	●	●K	●	●	●△	●	●	●	●	●	●K	●	...	●	...
Cheadle	T	...	●	...	...	●	●	●	K	●	●	●	●	●T	●	●	●	●T	●	●	●	●	●	●	●T	●T	●T	●T	...	...	...
Llandudno	≡	...	●	...	...	●	●	●≡	...	●	●	●	...	●	●	●	●	●	●	●	●*△	●	●	●	●	●	●	...	...	...	...
Chester	●	●	●	...	...	●	●	●	●	●	●	●	...	●	●K	●	●	●	...	...	●	●	●	●	●	●	●	...	...	...	...
Shrewsbury (Leaton)	...	●	●	...	...	●	●	●	●≡	●	●	●	●	●T	●	●	●	●K	●	●	●	●	●	●	●△	...	●T	...	...	...	...
Churchstoke	...	●	...	●	...	●	●	●	●	●	●K	●	●	●	●	●	●≡	●T	●T	●	●△T	●	●	●	●	●	●	K	...	...	...
Hereford	...	≡	●	...	...	●	●	●	●	●	●	●	●	●	●	●	●	●K	●	●	●	●	●	●K	●	●	●	≡	...	...	...
Cheltenham	●	...	●	...	...	●	●	●	T	●K	●	●	●	●	●	●	●K	●T	●	●	●	●	...	●	●	●	●	●△	...	...	●
Carmarthen	...	●	●	...	●	●	...	...	...	●T	●	●T	●	●	●	●	●	●K	●	●	●	●	●	●	●	●	●	●T	...	...	...
Dartmoor	≡	≡	≡	...	●	≡	...	...	≡	●T	...	●	≡	●	●	●	≡	●	●	●	●	●	●	≡	●	●	●	●T	≡	...	...
Babbacombe	≡	●	●	...	●	≡	○	...	○	●K	●≤	●○	●	●	●K	●	≡	≡	●	●	●	●○	...	...	●	●△	●	●△	...	...	...
Downside	●	≡	≡	●	...	...	●Ψ	●	●	●K≡	△	●	●	●	●	●	●K	●K	●	●	...	●	...	●	●	●	...	●K○	●	...	≡
Marlborough	●	≡○	●	...	...	●	●	...	K≡	●K	●K	●	●	●	...	●	●	●△K	●	●	●T	●	●	●	●	●	●○	●T	...	...	...
Strathfield Turgiss	T	≡	...	...	...	●T	●	≡	≡	●K	T	●	●	●	...	●	●	K	●	●	●	●	...	●T	●△	...	...	●K○	...	...	...
Norwood	●	...	...	...	...	●	●	...	●≡○	●	●	●Ψ	●Ψ	●	●	●	●	K	●	●	●TO	●	...	●	●	●	●	●	...	...	...
Eastbourne	...	●	●	...	...	●	●	...	●	●K	●	●	●K	●	●	●	●≤	K	...	●	●△K	●	...	●	●	●	...	≡	...	...	...
Ramsgate	●	...	≡	...	...	●	●	●	...	●T	●≤	●	●≤	●	●	●	●	●T≤	...	●	●	●	●	●	●	●	●	●	K	...	●
Audley End	●T≤	≡	●T	...	...	●	●	●	...	●	●	●	●T	●T	●	●	●	K	●	●	●△K	●	●	●	●T	●	●	●	...	...	...
Hillington	T≤	T	●	...	...	●	●	●	●	...	●	●T	●T	●	●	●	●	K	●	●	●*△K	●	●	●T	●T	●	●T	●	...	...	●
Lowestoft	≡	...	...	...	...	●	●	●	...	...	●	●	K	●K	...	●	●	●K	●△	●△	●	●	T	●T	●	●	...	●	...	...	●

Abstract of Meteorological Observations for the Month of JUNE, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of					Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.										Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.		Amnt.	Date.														
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.														
Gainford	29·942	59·2	54·8	57·0	48·0	66·7	38·8	15	86·3	27	53·8	52·5	69	85	6·3	6·4	2·90	1·02	11	12	0	3	11	0	4	7	2	8	6	10	1	5	17
Wakefield	·931	59·3	56·6	58·0	49·0	66·3	37·0	2	86·8	27	54·7	53·8	73	82	7·2	6·8	2·98	·58	3	13	0	2	13	0	5	10	6	11	5	5	8	2	8
Kelstern	·941	59·3	54·0	56·7	48·8	65·1	36·7	15	82·8	27	55·6	52·8	78	91	6·8	6·2	2·37	·92	4	12	0	3	11	0	8	6	7	12	8	11	2	4	2
Mansfield	·933	59·8	56·2	58·0	49·7	68·1	38·2	2	88·4	27	55·6	54·2	75	87	6·3	7·2	2·40	·58	4	13	0	2	12	0	6	6	6	5	4	12	4	0	17
Buxton	·943	57·2	52·9	55·0	47·0	63·4	36·0	2	80·4	26	53·1	51·1	75	88	6·6	7·7	4·00	1·12	4	16	0	1	13	0	2	3	9	9	4	11	10	12	0
Cheadle.	·934	56·9	55·3	56·1	49·1	65·3	41·3	6	82·0	27	53·4	52·8	78	84	7·3	6·3	3·65	·77	12	15	0	2	13	1	4	0	16	12	11	4	6	6	1
Llandudno	·903	60·8	56·7	58·7	52·6	67·0	45·8	1	93·0	27	56·1	53·5	73	80	6·6	5·9	1·68	·48	3	12	0	5	13	0	12	2	12	4	8	3	15	4	0
Chester	·915	59·9	57·6	58·8	51·3	68·3	39·8	6	87·0	27	55·5	54·2	74	79	6·7	5·7	3·55	·87	3	17	0	3	9	0	5	3	4	8	21	6	5	5	3
Shrewsbury (Leaton)	·930	59·8	56·2	58·0	49·5	67·9	35·0	6	88·0	26	57·3	55·1	84	92	7·2	5·1	2·91	·73	8	14	0	3	11	0	4	2	5	5	8	3	12	1	20
Churchstoke.....	·941	58·8	56·1	57·5	49·9	65·6	38·6	6	83·3	26	55·2	53·4	78	82	5·4	5·5	3·34	·49	3	16	0	2	3	0	0	7	7	12	6	14	5	8	1
Hereford	·923	60·7	57·2	59·0	51·1	68·1	42·8	15	84·6	26	56·3	54·5	74	83	6·7	5·8	2·37	·55	8	16	0	4	10	0	2	1	6	3	7	8	2	0	31
Cheltenham	·929	62·1	57·6	59·8	51·1	69·1	42·0	6	85·8	26	57·6	55·6	74	87	6·4	6·3	2·49	·47	2	15	0	3	8	1	3	3	2	3	15	8	11	3	12
Carmarthen	·912	62·3	56·0	59·2	51·3	68·1	41·9	18	85·0	27	59·1	54·9	81	93	7·1	5·7	2·99	·83	10	16	0	3	11	0	2	0	7	5	7	10	6	1	22
Dartmoor	·943	57·6	52·0	54·8	48·5	61·4	42·0	14	78·0	26	53·8	50·7	77	91	7·1	6·1	6·05	1·79	10	19	0	3	12	0	1	1	5	4	7	5	14	1	22
Babbacombe.....	·947	60·3	56·0	58·2	52·5	65·0	46·1	1	72·8	24	56·6	54·0	78	87	6·0	5·4	2·76	·57	18	18	0	2	6	1	2	12	6	5	3	11	7	4	10
Downside	·933	60·2	56·2	58·2	50·9	67·5	42·0	15	84·9	26	56·5	54·2	78	87	6·8	6·6	2·91	·83	10	12	0	1	12	3	1	7	6	2	13	12	4	1	14
Marlborough	·953	61·1	57·2	59·2	51·2	69·1	41·6	15	84·8	26	56·7	54·9	74	85	7·1	6·0	3·98	·67	18	15	0	3	13	0	2	6	4	2	5	11	4	0	26
Strathfield Turgiss..	·957	63·2	56·8	60·0	48·8	70·7	39·4	15	89·1	26	58·5	54·8	73	87	6·3	5·6	1·34	·32	2	14	0	5	12	0	1	0	8	7	6	25	3	4	6
Norwood	·953	62·8	58·3	60·5	51·6	69·9	43·1	2	86·6	26	56·9	55·1	67	80	6·0	5·0	2·34	·41	23	16	0	4	7	1	2	4	8	6	6	8	11	0	15
Eastbourne	·957	62·4	58·3	60·4	52·9	68·3	43·6	6	83·0	25	57·4	55·6	72	83	6·1	5·0	1·21	·39	30	12	0	6	8	2	3	5	6	8	3	4	16	9	6
Ramsgate	·983	61·1	57·0	59·0	53·5	66·4	45·8	16	82·7	26	57·2	54·6	77	85	6·6	5·3	1·43	·58	24	9	0	2	6	2	0	17	4	7	3	17	2	4	6
Audley End	·937	62·4	54·5	58·4	48·9	68·8	35·6	2	85·9	26	57·4	53·2	72	91	6·6	4·5	1·66	·27	12	15	0	3	7	0	0	7	1	6	1	17	2	10	16
Hillington	·919	62·6	54·9	58·8	49·1	69·1	37·3	15	87·8	26	57·5	53·7	71	92	6·8	5·9	2·05	·50	4	12	0	4	14	0	0	9	4	9	5	20	9	2	2
Lowestoft	29·947	59·8	55·3	57·5	51·2	64·0	39·7	2	75·7	26	55·9	53·3	77	87	6·3	4·9	1·08	·35	19	10	0	6	10	0	4	8	7	3	9	10	12	5	2
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

DATE.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Gainford	...	●	●	●	...	●	●	●	●	●	●	●ϟT	...	...	...	●	●	...	...	T	...	...	...	...	...	...	...	...	...	...
Wakefield	...	●	●	●	...	...	...	●	●	●	●	●	...	...	...	●	●	●	...	...	●	ϟ	●	▲	...	...	T	...	...	...
Kelstern	...	●	●	●ϟ	...	●	...	●	●T	●T	●T	●	...	...	...	●	●	...	...	...	...	●T☰	...	...	...	...	...	...	...	...
Mansfield	...	●	●	●	...	...	...	●	●T	●	●ϟ	●	...	...	●	●	...	●	●	...	...	...	T	...	...	●ϟ	...	...	...	...
Buxton	...	●	●	●	●	●	...	...	●T	●	●	●	●	●	...	●	●	●	...	...	●	...	...	...	...	●ϟ	...	...	...	...
Cheadle	...	●	●☰	●	...	●	...	●T	●	●	●	●	●	...	●	●	●	●	...	...	...	...	...	...	...	●T	...	...	...	...
Llandudno	...	●	●	●	...	...	...	●	●	●	●	●	●	...	●	...	...	...	...	●	●	...	...	...	...	...	...	...	...	...
Chester	●	●	●T	●	...	...	●	●	●	●	●	●	●	●	...	●	...	...	...	●	●	...	●T	...	...	●	...	...	...	...
Shrewsbury (Leaton)	●	●☰	●☰	●	●	...	●	●ϟ	●T	●	●	●	●	...	...	...	...	...	...	...	...	...	●ϟ	●T	...	...	...	...	ϟ	...
Churchstoke	...	●	●	●	...	●	●	●	●	●	●	●	●T	●☰	...	●	●T	●	...	...	...	...	...	...	...	...	...	●	...	...
Hereford	☰	●	●	●	●	●	●	●ϟ	●	●	●	●	☰	...	●☰	●☰	●ϟ⊏	●	...	...	...	...	...	...	...	...	...	...	●ϟ	...
Cheltenham	...	●	●	●	●	...	●	●	●	●	●	●	...	...	...	●	●ϟ	●	...	...	...	...	●ϟ	...	...	T	...	...	T	●T
Carmarthen	...	●	●	●	...	...	●	●	●	●	●	...	●	●	...	●	...	...	●	●	●	...	...	...	...	...	...	...	●ϟ	●T
Dartmoor	●	●☰	●	●	●	...	●	●☰	●	●	●	●	●	●	●	●	●	...	...	...	...	...	...	...	...	...	●	●☰	...	●▲ϟ
Babbacombe	●	●☰	●	...	●	...	●○	●	●	●○	●	●	●	●	●T	●☰	●	●	●	...	...	☰	○	..	...	...	ϟ	●ϟ	T ϟ	...
Downside	☰	...	●	●	...	...	...	●	●	●▲	●	●	...	...	●ϟ	...	●ϟ	●	...	...	○	...	...	...	...	...	...	...	●	●T
Marlborough	☰	●	●	●	T●	...	ψ	●	●	●	●	●	●	...	...	●ϟ	●ϟ	●	...	☰	...	...	▲ϟ	...	...	...	...	...	●ϟ	●
Strathfield Turgiss	☰	T	●	●	●☰	...	...	●T	●	●	●	●	●	...	...	●ϟ⊏	●ϟ⊏	●T	☰	...	...	...	T	...	...	T	☰	☰	●ϟ	●T
Norwood	...	●	●	●	●	☰	○ψ	●ϟ	●	●ϟ	●	●	...	...	●	●ϟ	●T	●ϟ	●ϟ⊏	☰	...	...	●ϟ	...	...	...	...	...	...	●T
Eastbourne	...	●	...	●	●	...	...	●ϟ	●	...	...	...	...	●	...	●T	●	●	●	...	...	...	...	...	...	...	...	...	●	●
Ramsgate	...	●	●	●	...	...	...	ϟ	...	●	●	...	...	...	...	...	...	●	...	...	...	...	...	●	●	...	...	...	●	...
Audley End	...	●	●	●	...	...	...	●	...	●	●	●	●	...	...	●	●	●	●☰	...	☰	...	●ϟ	●T	...	...	...	...	...	●
Hillington	...	●	●	●▲ϟ	...	...	...	●T	●	●	●	●	...	...	...	●	●	...	●T	...	...	...	ϟ	●	T	...	...	...	...	...
Lowestoft	...	●	●	●▲ϟ	...	...	...	●ϟ	...	...	●	●	...	...	...	●	...	●	●	...	..	...	...	...	...	...	...	...	...	●

EXPLANATION OF THE SYMBOLS.—● indicates rain; ✱ snow; ▲ hail; ☰ fog; ϟ thunderstorm; T thunder; ϟ lightning; ○ solar halo; ψ lunar halo.

LIST OF THE STATIONS, WITH THE NAMES OF THE OBSERVERS, &c.

Station.	County.	Lat.	Long.	Height of Ground.	Observer.
Audley End	Essex	52° 1′N.	0°15′ E.	154ft.	J. Bryan.
Babbacombe	Devon	50 29	3 31 W.	293	E. E. Glyde, F.M.S.
Buxton	Derby	53 14	1 54 W.	987	E. J. Sykes, F.R.A.S., F.M.S.
Carmarthen	Carmarthen	51 52	4 18 W.	188	G. J. Hearder, M.D.
Cheadle	Stafford	52 58	1 57 W.	646	J. C. Philips, J.P., F.M.S.
Cheltenham	Gloucester	51 54	2 3 W.	184	R. Tyrer, B.A., F.M.S.
Chester	Cheshire	53 12	2 53 W.	63	A. O. Walker, F.L.S., F.M.S.
Churchstoke	Montgomery	52 31	3 5 W.	549	P. Wright, F.C.S., F.M.S.
Dartmoor Prison	Devon	50 33	3 59 W.	1372	R. E. Power, L.R.C.P., F.M.S.
Downside	Somerset	51 15	2 29 W.	592	Rev. T. L. Almond, O.S.B.
Eastbourne	Sussex	50 46	0 16 E.	24	S. Bretton, F.M.S.
Gainford	Durham	54 33	1 44 W.	249	A. Atkinson.
Hereford	Hereford	52 5	2 45 W.	274	T. A. Chapman, M.D.
Hillington	Norfolk	52 48	0 33 E.	88	Rev. H. Ffolkes, F.M.S.
Kelstern	Lincoln	53 24	0 7 W.	388	D. G. Briggs, F.M.S.
Llandudno	Carnarvon	53 21	3 50 W.	79	J. Nicol, M.D., F.M.S.
Lowestoft	Suffolk	52 29	1 45 E.	85	S. H. Miller, F.R.A.S., F.M.S.
Mansfield	Notts	53 8	1 12 W.	349	W. Tyrer, F.M.S.
Marlborough	Wilts	51 25	1 43 W.	471	Rev. T. A. Preston, M.A., F.M.S.
Norwood	Surrey	51 26	0 6 W.	184	W. Marriott, F.M.S.
Ramsgate	Kent	51 20	1 25 E.	105	Rev. E. D. O'Gara, O.S.B., F.M.S.
Shrewsbury (Leaton)	Salop	52 45	2 57 W.	266	Rev. E. V. Pigott, F.M.S.
Strathfield Turgiss	Hants	51 20	1 0 W.	195	Rev. C. H. Griffith, F.M.S.
Wakefield	Yorks	53 41	1 30 W.	96	H. Clarke, M.R.C.S., F.M.S.

NOTE ON THE TABLES.

Column 1 is the mean of the readings of the barometer at 9 a.m. and 9 p.m. corrected for temperature and reduced to sea-level.

Column 4 is the mean of the readings of the dry-bulb thermometer at 9 a.m. and 9 p.m.

Columns 5 to 10. The maximum and minimum thermometers are read and set at 9 p.m., and the readings entered to the same day.

Columns 13 and 14. The relative humidity is calculated by dividing the elastic force of vapour at the temperature of the dew-point for the month by that at the temperature of the air (*i.e.* dry-bulb reading).

Columns 15 and 16. The amount of cloud is estimated according to the scale 0—10, 0 representing a cloudless sky, and 10 a completely covered or overcast sky.

Columns 17 to 20. The rain is measured at 9 a.m., and the amount entered to the previous day. A fall of ·006 in. and above constitutes a day of rain.

Column 21. When any snow falls it is entered as a day of snow.

Columns 22 and 23. When the mean of the 9 a.m. and 9 p.m. observations of cloud is less than 2·0, this is called a day of clear sky, but when the mean is above 8·0 it is called an overcast day.

Column 24. When the force of the wind is 7 and above (on the scale 0—12) this is counted as a gale.

Columns 25 to 33 give the sums of the observations of the direction of the wind at 9 a.m. and 9 p.m.

Report on the Meteorology of England for the Quarter ending SEPTEMBER 30TH, 1878, *with Monthly Abstracts of the Observations made at the Society's Stations.* By WILLIAM MARRIOTT, Assistant-Secretary.

ATMOSPHERIC PRESSURE was, on the whole, a little below the average for the quarter.

In *July* the mean, reduced to sea-level, was 30·05 in., which is ·11 in. above that of June; the highest being in the SW, and the values decreasing towards the E to 30·013 in. at Lowestoft. The maximum occurred at most of the stations on the 31st, the highest, 30·455 in., however, being at Buxton on the 18th, at 9 a.m., while the minimum was recorded on the 24th, the lowest being 29·632 in. at 9 p.m. at Mansfield.

In *August* the pressure was lower, and subject to more variation than in the preceding month, the mean, 29·75 in., being ·30 in. below that of July. The readings were almost in the reverse order to those of the previous month, viz. decreasing from the SE to the W, the highest being 29·798 in. at Ramsgate, and the lowest 29·729 in. at Llandudno. The maximum occurred at all the stations on the morning of the 1st, the highest being 30·381 in. at Mansfield, while the minimum took place at most stations on the 14th, although the lowest, 29·082 in., was observed at Babbacombe at 0.40 a.m. on the 30th.

In *September* the mean was 29·98 in., which is ·23 in. above that of August, with the highest in the SW, and values decreasing towards the N. Pressure was comparatively high and steady till the 14th, but after that date it was low and subject to considerable oscillation. The maximum occurred at the southern and western stations on the 2nd and 3rd, and at the northern on the 10th, the highest being 30·332 in. at Buxton at 9 p.m. on the 10th, and 30·330 in. at Carmarthen at 9 a.m. on the 3rd, while the minimum, 29·169 in., took place at 6 p.m. on the 15th, at Gainford.

AIR TEMPERATURE for the quarter has been a little above the average.

In *July* the mean temperature was 60°·9, or 2°·7 above that of June, and varied from 57°·4 at Dartmoor and 57°·9 at Buxton to 63°·6 at Eastbourne. The weather for the first few days was cold, but was afterwards warm, especially so from the 16th to the 23rd, during which period the maximum readings were registered, the highest, 86°·8, occurring both at Gainford and Strathfield Turgiss on the 19th. The minimum was recorded at most stations on the 4th, the lowest being 36°·5 at Audley End. The mean daily range was 16°7.

In *August* the mean temperature was 60°·1, or 0°·7 below that of July, and varied from 56°·1 at Dartmoor and 56°·7 at Buxton to 63°·1 at Eastbourne and 63°·0 at Ramsgate. The weather during this month was somewhat cool. The maximum occurred on various dates, the highest being 78°·6 at Audley End and 78°·5 at Llandudno on the 5th, and 78°·6 at Hillington on the 6th. The minimum was registered at the central stations on the 1st, and at several others on the 21st and 22nd, the lowest reported being 40°·0

at Dartmoor on the 7th and 12th, and 40°·1 at Hillington on the 22nd. The mean daily range was only 14°·6, owing to the prevalence of cloud.

In *September* the mean temperature was 55°·8, or 4°·3 below that of August, and varied from 52°·5 at Buxton and 52°·6 at Dartmoor to 59°·2 at Eastbourne and 58°·2 at Ramsgate. The weather was mild during the first part of the month, but cold during the remainder. The maximum was recorded at most stations between the 4th and the 7th, the highest being 76°·6 at Lowestoft on the 6th. The minimum readings took place mostly on the 24th, the lowest being 30°·5 at Strathfield Turgiss. The mean daily range was 16°·0.

RAINFALL.—In *July* the total rainfall, as well as the number of rainy days, was small, the average falls being less than an inch, with only 8 wet days. The total falls varied from 2·61 in. at Marlborough to 0·48 in. at Audley End and Gainford. The greatest daily falls occurred at most stations on the 24th, the maximum reported being 1·64 in. at Shrewsbury.

In *August* the rainfall and the number of rainy days were large, with frequent thunderstorms. The total falls varied from 9·12 in. at Dartmoor and 8·27 in. at Mansfield to 3·61 in. at Ramsgate and 3·84 in. at Audley End. The greatest falls measured in one day were 1·95 in. at Carmarthen on the 4th, and 1·93 in. at Hillington on the 3rd. At Hereford 2·37 in. fell between 9 p.m. on the 22nd and noon on the 23rd, a space of 15 hours. (Mr. W. Adams reports that the rainfall measured at Cardiff amounted to 10·82 in., of which 3·64 in. fell during a severe thunderstorm on the 15th.)

In *September* very little rain fell during the first 6 days, but from the 15th to the 25th the weather was for the most part wet. The total falls varied from 5·21 in. at Dartmoor and 5·19 in. at Buxton to 0·75 in. at Norwood and Strathfield Turgiss. The greatest daily amount was 2·75 in. at Hereford, which fell in about an hour-and-a-half in the early morning of the 8th, during a thunderstorm.

WIND.—In *July* the general direction during the first part of the month was from W, but from E to NE during the remainder. In *August* E winds prevailed from the 1st to the 16th, W from the 7th to the 18th, and E and variable from the 19th to the end of the month. Gales occurred at nearly all the stations, chiefly on the 14th and 30th. In *September* the prevailing direction was from the W. A gale was experienced at most stations on the 15th.

NOTES BY THE OBSERVERS.

AUDLEY END, *August 12th.*—Very heavy storm at 4.30 p.m., 0·75 in. fell in 12 minutes.

BABBACOMBE, *July.*—A dry, fine and hot month, the driest since June 1877, and the warmest since July 1876. The nights were especially warm averaging 56°·0, the coldest being only 51°·0 on the 1st and 4th; the warmest period was from the 17th to the 22nd.

August.—A very wet, stormy and cloudy month: most unfavourable for harvest operations; a large quantity of cereals cut on the 18th still

remaining damp in the fields at the end of the month. The 2nd, 4th and 8th were the only days on which no rain fell, though the fall on a few others did not amount to ·01 in. The temperature was warm and equable.

September.—This month has been a dry, fine one, especially its first half, when the temperature and barometer were high. No rain was measured during the 10 days from the 5th to the 14th. From the 15th to the 22nd the weather was wet and stormy, with an unsteady barometer and rapid fall of temperature. After the 25th the barometer and temperature rose again, and the weather became fine. A colourless lunar rainbow was seen on the evening of the 15th, and a faint one on the 18th. The harvest was completed during the first week.

CHELTENHAM, *August 10th.*—Heavy thunderstorm from 3.45 to 5.30 p.m. with breaks, 1·18 in. in 55 minutes.

September.—The leaves on most of the trees, except the early ones, still green. A very fine Aurora was observed on the night of the 6th, the waving clouds of light streaming some degrees past the zenith.

CHURCHSTOKE, *July 21st.*—Hay harvest ended.

August 18th.—Sea gulls seen.

HEREFORD, *September 8th.*—Thunderstorm 4 a.m., with heavy rain, 2·75 in. in an hour-and-a-half; hail in ice masses over an inch long.

HILLINGTON, *August 3rd.*—Rain of extraordinary violence, especially from 5.50 to 6.45 a.m. of 4th, with thunder and lightning; surface of road washed away.

16th.—Ash tree in Hillington Park struck by lightning; bark hurled 25 yards.

24th.—Very little rain fell here, but on all sides round, SE, S, SW, W and N, violent rain with hail.

The most rainy August for 12 years, except 1872, when 6·60 in. fell (3·75 in. in one night). The average for the past 12 years is 2·42 in.

NORWOOD, *September.*—Flies and wasps have been very numerous this season.

CORRECTIONS, &c.

CHELTENHAM, *July.*—The wet bulb readings appear to be too high. The humidity is, therefore, probably too great.

STRATHFIELD TURGISS, *August.*—The barometer readings are too low, the deputy observer having cut off the upper portion of the mercury.

Erratum.—WAKEFIELD, *June.*—The Mean Maximum Temperature should be 66°·6, instead of 66°·3.

Abstract of Meteorological Observations for the Month of JULY, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of				Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.														
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.														
Gainford	30·038	62·5	58·2	60·4	52·5	71·2	40·0	30	86·8	19	57·4	55·6	71	84	6·3	5·2	·48	·11	2	7	0	3	7	0	4	10	0	1	5	10	7	3	22
Wakefield	·037	62·7	59·7	61·2	54·0	69·4	40·0	4	85·2	20	57·3	56·2	70	79	7·0	5·5	·74	·33	24	9	0	2	9	0	5	5	7	2	1	3	22	4	13
Kelstern	·033	61·7	55·9	58 8	51·8	68·5	41·0	4	81·6	18	58·3	54·4	80	90	7·7	6·1	1·20	·44	25	11	0	1	14	0	8	13	2	4	1	4	11	15	4
Mansfield	·044	61·4	58·6	60·0	52·9	69·9	41·9	4	83·2	19	58·1	56·6	80	87	7·2	5·4	1·08	·40	27	9	0	3	9	0	9	3	7	2	1	3	15	2	20
Buxton	·055	59·9	55·8	57·9	51·1	65·2	40·4	13	79·8	21	56·2	53·7	78	86	6·5	6·5	1·74	1·11	24	11	0	2	10	0	4	9	7	3	0	5	4	28	2
Cheadle	·049	59·5	57·8	58·6	53·0	66·5	46·8	4	81·8	21	56·4	55·4	81	85	7·7	5·9	1·76	·98	24	9	0	1	12	1	3	4	13	4	2	4	9	23	0
Llandudno	·057	63·5	59·8	61·7	55·7	71·7	46·9	13	83·6	23	58·7	56·8	73	82	6·8	6·1	1·18	1·05	24	4	0	8	17	0	10	6	8	1	2	2	19	14	0
Chester	·054	63·3	60·0	61·6	53·8	70·4	43·8	13	86·1	21	58·5	56·9	73	80	7·4	5·4	·80	·43	24	7	0	1	9	0	11	3	2	3	5	4	10	21	3
Shrewsbury (Leaton)	·065	62·3	58·2	60·3	51·7	70·0	41·0	9	85·0	20	59·4	56·4	83	89	..	..	2·02	1·64	24	9	0	..	..	..	..	..	..	..	..	..	..	..	..
Churchstoke.....	·077	60·8	58·4	59 6	51·7	68·4	42·0	28	81·8	21	57·3	55·9	79	84	6·6	5·2	1·20	·89	24	8	0	1	7	0	5	7	5	2	2	4	13	15	9
Hereford	·054	63·4	60·5	61·9	52·1	70·8	44·0	26, 28	84·0	17	58·2	57·0	71	79	7·2	5·0	·51	·40	24	6	0	2	9	0	4	10	2	0	3	2	9	7	25
*Cheltenham	·053	63·5	60·6	62·1	52·4	71·5	39·5	30	84·8	19	61·0	57·2	85	91	6·6	6·2	2·06	1·61	24	7	0	2	9	0	14	3	3	3	8	2	9	14	6
Carmarthen	·062	65·4	59·5	62·4	55·1	73·0	45·0	28	85·4	21	61·3	57·8	77	89	6·1	4·8	1·95	1·03	23	10	0	5	10	0	12	6	5	1	0	4	8	7	19
Dartmoor	·073	59·4	55·4	57·4	51·9	65·1	46·0	1	79·8	18	56·6	54·0	83	91	7·1	4·6	2·41	·68	12	15	0	3	10	0	9	5	9	0	1	1	14	6	17
Babbacombe.....	·074	63·8	60·1	61·9	56·0	69·2	51·0	1, 4	78·3	18	59·3	57·5	75	84	6·5	5·1	1·51	·57	12	9	0	5	11	0	4	11	9	1	0	4	14	14	5
Downside	·055	62 2	59·1	60·7	53·6	70·0	46·0	28	81·8	21	59·0	57·2	81	88	7·2	5·2	2·03	·75	23	11	0	1	8	0	11	8	5	2	6	7	8	8	7
Marlborough	·064	63·4	59·4	61·4	53·3	71·8	43·7	4	83·9	19	59·5	57·6	77	89	7·2	4·9	2·61	1·16	1	8	0	2	10	0	3	7	3	0	1	2	8	2	36
Strathfield Turgiss..	·054	65·4	59·7	62·5	51·7	75·0	42·1	30	86·8	19	60·8	57·7	74	87	6·2	6·5	·98	·38	24	7	0	5	8	0	1	3	8	8	1	18	3	11	9
Norwood	·045	64·2	61·1	62·7	54·5	72·6	44·6	4	83·3	19	59·1	57·8	72	80	5·9	6·0	·94	·49	26	9	0	3	10	0	9	5	8	1	2	2	12	9	14
Eastbourne	·044	65·8	61·4	63·6	55·9	71·1	48·0	4	82·0	18	60·9	59·0	73	85	5·5	5·5	·83	·44	1	7	0	5	7	0	3	9	5	7	0	5	16	15	2
Ramsgate	·057	64·6	60·5	62·6	56·0	69·4	49·4	4	82·0	18	59·7	58·c	73	85	6·4	6·5	·86	·27	29	7	0	3	11	0	2	18	5	1	1	13	8	9	5
Audley End	·024	63·5	57·9	60·7	52·1	70·6	36 5	4	83·9	19	58 8	56·0	74	88	7·4	5·5	·48	·28	24	6	0	0	8	0	8	12	0	3	0	2	13	17	7
Hillington	·023	63·8	57·6	60·7	51·9	71·4	41·3	4	86·1	20	59·6	56·2	76	91	7·5	7·9	·81	·23	29	9	0	2	16	0	12	9	6	6	0	5	7	15	2
Lowestoft	30·013	62·5	57·7	60·1	53·4	67·7	41·3	4	76·8	16	58·6	55·9	77	88	7·3	6·0	·97	·32	29	10	0	1	13	0	5	12	5	4	2	1	14	17	2
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

* See note on page 28.

DATE.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Gainford	...	●	...	●	...	...	...	●	...	...	...	...	...	...	...	...	...	...	...	⊤	...	☰	●ϟ	●	●⊤≺	...	●	...	..	...	...
Wakefield	...	●	...	...	...	...	...	...	●	●	...	...	...	...	...	...	...	...	...	...	...	...	●	●	●	●	●	...	●	...	...
Kelstern	●	●	...	...	...	...	●	...	..	●	...	...	...	...	...	...	...	...	...	...	...	●☰	●	ϟ	●⊤	●⊤	●	●	●	...	...
Mansfield	...	●	...	...	...	●	...	...	●	●	...	...	...	...	...	...	...	...	...	...	...	☰	●	●ϟ	●☰	●	●ϟ	...	...	...	...
Buxton	...	●	●	...	●	●	...	...	●	●	●	...	...	...	...	...	...	...	...	...	...	...	●	●	●	...	●	...	...	...	...
Cheadle	...	●	●ϟ	...	●	...	...	...	●	●	●	...	...	...	...	...	..	...	...	...	...	...	●	●⊤	●	...	...	...	...	...	...
Llandudno	☰	...	...	...	...	●	...	...	...	●	...	...	...	...	...	...	..	...	☰	...	...	...	...	●☰⊤	●☰	...	...	...	...	...	...
Chester	...	...	...	...	...	..	...	...	●	●	●	...	...	●	...	...	...	...	...	...	...	...	●	●	●	...	...	...	...	...	...
Shrewsbury (Leaton)	...	...	...	...	⊤	●	●	...	●	●	●	...	≺	...	...	...	...	...	..	...	...	⊤	●	●☰ϟ	●	...	●	...	...	...	...
Churchstoke	...	...	...	●	...	●	...	...	●	●	...	...	...	...	...	...	...	..	..	...	...	●ϟ	●⊤	●	...	●	...	...	...	...	...
Hereford	☰	...	...	...	...	...	...	...	●	...	...	●☰	...	...	...	...	...	...	☰	...	...	●☰	●☰	●	...	●	...	...	...	...	..
Cheltenham	...	...	...	●	●	–	...	...	...	...	...	●	⊤	...	...	...	...	...	..	...	...	ϟ	●	●⊤	●	●ϟ	...	...	⊤	...	...
Carmarthen	●	...	...	●	●	..	...	...	●	...	...	●	...	...	...	...	...	...	ϟ	...	ϟ	●ϟ	●	●	●	●	...	...	...	...	...
Dartmoor	●	●☰	...	...	●	●☰	●	...	●☰	...	●☰	●☰	☰	...	●	...	...	...	...	...	...	●ϟ	●☰	●☰	●	●	●	...	...	...	...
Babbacombe	●	●	...	...	...	...	●	...	●	...	...	●	...	...	...	...	...	...	≺	ϟ≺	ϟ	●ϟ	●☰	☰	●	●☰	○	...	...	...	..
Downside	●⊤	●	●	...	...	●	...	...	...	●	...	●	...	...	...	...	...	..	ϟ	...	...	ϟ	●☰⊤	●	●	●	●	...	☰	...	...
Marlborough	●	●	●	...	...	...	...	...	●	...	...	●	...	...	...	...	...	...	ϟ	...	...	●ϟ	●☰ϟ	●☰ϟ	...	...	...	...	...	...	...
Strathfield Turgiss	●☰⊤	●	☰	...	...	...	...	☰	●	...	...	●	...	...	...	☰	☰	☰	☰	...	...	●☰ϟ	●☰⊤≺	●ϟ	...	...	...	☰	☰	...	...
Norwood	●	●	●	...	...	○	●	...	●	...	...	●	...	...	...	☰	...	...	...	...	...	...	⊤	●⊤	●	●ϟ	...	...	...	...	...
Eastbourne	●	●	●	...	...	...	...	...	●	...	...	●	...	...	...	☰	...	...	...	...	≺	●⊤	☰	●≺	...	≺	...	...	...	...	...
Ramsgate	...	●	●	...	...	...	...	...	●	...	●	...	...	...	...	☰	...	...	...	...	...	●☰	☰	...	...	≺	●	...	●	...	...
Audley End	...	...	●	...	...	...	...	●	...	...	...	...	...	...	...	...	...	...	...	...	...	●☰	...	●☰ϟ	●	≺	...	...	...	●	...
Hillington	...	...	...	...	●	...	...	...	●	...	...	...	...	...	...	...	...	...	...	...	...	...	●ϟ≺	●ϟ	●☰⊤	⊤	●	●	●	●	...
Lowestoft	...	●	...	...	...	...	●	...	●	...	●	●	...	...	...	...	...	...	...	...	...	...	●ϟ	●☰	●⊤	...	●	...	●	...	...

EXPLANATION OF THE SYMBOLS.—● indicates rain; ✱ snow; ▲ hail; ☰ fog; ϟ thunderstorm; ⊤ thunder; ≺ lightning; ○ solar halo; Ψ lunar halo.

Abstract of Meteorological Observations for the Month of August, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of					Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.														
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.														
Gainford	29·761	61·4	57·0	59·2	52·4	69·0	42·4	1	73·2	26	57·7	55·2	78	89	6·7	6·0	4·90	1·40	30	19	0	0	9	0	1	7	11	6	5	9	5	2	16
Wakefield	·741	61·2	58·2	59·7	52·6	68·5	43·8	22	73·4	2	57·7	56·0	79	86	7·1	6·3	5·64	·78	13	23	0	1	9	0	3	13	11	5	4	5	12	2	7
Kelstern	·751	61·1	56·6	58·8	52·5	67·7	44·1	21	72·6	6, 18	58·5	55·7	84	94	7·0	5·3	5·92	1·02	13	26	0	0	8	0	2	9	14	5	4	13	7	7	1
Mansfield	·758	60·6	57·3	59·0	53·2	68·1	43·9	1	72·8	9, 26	57·5	55·4	81	88	5·9	4·5	8·27	1·30	23	24	0	8	8	0	6	6	8	6	1	13	12	3	7
Buxton	·764	58·1	55·3	56·7	50·8	64·5	42·2	26	69·5	2	55·6	53·9	85	91	7·7	6·0	6·44	1·09	13	23	0	0	9	0	1	2	7	13	6	9	9	12	3
Cheadle	·745	58·4	56·8	57·6	52·0	66·5	43·2	17	70·8	2, 5	56·3	55·2	87	89	7·9	6·8	7·91	1·21	6	25	0	1	15	2	2	4	17	8	10	9	7	5	0
Llandudno	·729	63·3	59·3	61·3	55·6	70·9	51·2	26	78·5	5	58·9	56·9	75	85	7·1	6·2	4·46	1·57	13	18	0	2	14	2	5	2	12	5	4	10	18	6	0
Chester	·740	62·1	59·6	60·8	54·4	69·4	47·0	26	75·4	2	58·1	56·9	77	83	7·2	6·2	4·54	1·01	13	20	0	0	6	5	4	5	8	6	12	8	6	8	5
Shrewsbury (Leaton)	·750	60·5	57·8	59·1	52·6	68·9	43·9	1	74·9	5	57·6	56·5	82	91	..	..	5·16	·98	6	20	0	..	..	..	..	..	..	..	..	..	..	..	..
Churchstoke	·759	59·1	57·7	58·4	52·5	66·5	44·2	1	70·2	7	56·3	55·6	83	87	6·9	6·8	5·71	1·16	23	18	0	0	9	0	2	7	8	7	3	11	15	3	6
Hereford	·741	61·1	58·9	60·0	53·9	68·1	47·0	9	73·4	10	58·1	56·7	82	86	8·0	6·5	6·58	1·26	23	21	0	0	12	0	0	5	10	4	6	9	10	2	16
Cheltenham	·747	62·8	59·2	61·0	54·7	70·1	47·6	9	74·6	10	59·1	57·4	78	89	7·5	5·6	5·29	1·18	10	20	0	1	11	0	4	4	6	1	17	6	14	6	4
Carmarthen	·730	63·2	58·7	61·0	54·6	69·4	47·0	17	75·5	1	59·4	56·9	78	88	8·0	7·1	7·03	1·95	4	22	0	2	15	0	1	6	15	3	2	9	19	1	6
Dartmoor	·746	57·8	54·4	56·1	50·5	61·9	40·0	7, 12	68·1	19	56·1	53·7	89	95	7·1	6·4	9·12	1·67	13	26	0	0	9	0	1	5	12	2	5	12	11	8	6
Babbacombe	·764	62·9	59·0	61·0	56·3	68·0	49·0	17	72·8	8	59·8	57·4	81	90	7·8	6·1	4·72	·82	20	21	0	1	12	5	1	6	9	2	5	15	17	2	5
Downside	·749	60·4	57·8	59·1	54·3	67·7	48·7	1	74·0	10	57·9	56·4	84	91	8·4	6·8	7·82	1·20	13	21	0	0	12	2	4	8	2	7	4	15	12	6	4
Marlborough	·770	61·7	58·4	60·0	54·7	70·4	48·0	1	74·6	5	58·8	56·9	83	91	8·3	5·7	5·52	1·44	22	19	0	0	10	0	2	2	7	1	1	16	3	0	30
Strathfield Turgiss ..	·736*	63·9	59·3	61·4	55·5	71·5	48·6	1	77·6	5	60·2	57·3	81	87	7·9	6·4	4·38	·65	22	18	0	0	14	0	0	0	11	10	3	27	8	0	
Norwood	·769	63·4	60·2	61·8	55·4	70·8	50·8	17, 26	77·6	5	59·5	57·8	77	85	7·1	4·5	6·02	1·16	24	18	0	2	5	2	0	4	12	1	8	11	13	0	13
Eastbourne	·781	64·8	61·4	63·1	57·2	69·7	52·0	20	74·1	5	60·8	59·0	77	85	7·5	6·8	4·74	1·17	29	21	0	0	11	3	3	7	3	3	4	12	18	11	1
Ramsgate	·798	65·0	61·1	63·0	57·8	69·6	52·8	21	76·0	8	60·7	59·2	76	88	6·9	5·8	3·61	·76	16	17	0	0	7	2	0	12	7	2	2	33	2	0	4
AudleyEnd	·743	63·7	58·5	61·1	54·6	70·7	43·3	21	78·6	5	59·7	56·9	77	90	6·9	6·3	3·84	·76	12	22	0	0	10	0	0	9	2	10	1	16	9	7	8
Hillington	·747	64·0	58·4	61·2	53·2	71·1	40·1	22	78·6	6	61·2	57·4	83	93	6·7	6·7	5·59	1·93	3	20	0	0	11	0	1	11	6	11	3	16	5	8	1
Lowestoft	29·747	63·7	60·4	62·1	56·2	68·9	47·2	21	75·7	8	60·3	58·5	80	88	6·5	5·7	4·35	·89	3	19	0	2	11	1	1	8	11	6	4	9	19	4	0
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

* See note on page 25.

...servations observed at the Stations during AUGUST, 1878.

DATE.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Gainford	...	...	●	●	...	●	●T	...	●	●	●	●	●	...	●	●T	○	...	...	...	...	...	●	●	●	...	●	●	●☰	●▲☰K	●
Wakefield	...	●	●	●	●T	●K	●	...	●	●	●	●	●	●	●	●	●K	...	...	...	...	●	●	●K	...	...	●	●	●K	●	●
Kelstern	●	●	●☰	●☰T	●☰	●☰K	●K	●	●	●☰	●	●K	●	●	●	●T	●	...	...	...	...	●	●	●	●☰	T	●☰T	●T	●	●K	●
Mansfield	...	●	●	●K	●	●▲K	●	●T	●	●	●	●	●	●	●	●	●	...	...	...	...	●	●	●K	...	●	●	...	●≺	●▲☰K	●T
Buxton	...	●	●	●☰	●T	●K	●	●	●	●	●	●	●	●	●	●	●	...	...	...	...	●	●	K	☰	●	●≺	●≺	≺	●K	●K
Cheadle	...	●	●	●T	●T	●K	●T	...	●	●	●	●	●	●	●	●T	●	...	...	...	...	●	●	●K	●	●	●	●	●	●K	●K
Llandudno	...	...	●	●	●≺	●K	...	...	●	...	●	...	●	●	●	●	●	...	...	...	...	●	●	...	...	●	●≺	●	●☰≺	●	...
Chester	...	...	●	●	●T	●	●	●	●	●	●	...	●	●	...	...	●	...	...	...	...	●	●	...	...	●	●≺	●	●	●T	●
Shrewsbury (Leaton)	...	●	●	●T	K	●☰K	●	...	●	●K	●	●	●	●	●	...	●	...	...	...	...	●	●	☰	...	...	●	●	●≺	●K	●
Churchstoke	...	●	●K	●T	●	●	●K	...	●	T	●T	...	●T	..	●	●	●	...	...	...	...	●	●	...	...	●	●	...	●	●	...
Hereford	...	●	●K	●	●K	●K	...	...	●	●K	●	●	●	...	●	●	...	..	☰	...	...	●	●	●	●	●☰	●	●	●	●	...
Cheltenham	...	●	●T	●	●	●	...	...	●	●K	●	●	●	●	●	●K	...	...	...	...	●	●	●	...	...	...	●T	●	●	●	T
Carmarthen	...	...	●K	●	●	●K	...	...	●	●	●	●	●	...	●	●≺	●	...	●	●	...	●	●≺	...	...	●	●	●	●	●	●
Dartmoor	...	...	●	...	●	●☰	●	●T	●☰	●☰	●☰	●	●☰	●☰	●☰	●	●	●	●	●☰	☰	●	●☰	●☰K	...	●☰	●☰K	●	●	●	●
Babbacombe	...	...	●K	●	●	●	...	...	●☰	●	●	●	●	●	●	●	...	○	●	●	...	●	≺	●K	...	●	●	●	●K	●	...
Downside	...	...	●K	●☰	●	●	●K	...	●	●T	●	●	●	T	●≺	●	...	...	☰	●	●	●☰	K	...	...	●	●	●	●	●	●
Marlborough	...	...	●K	●	●	...	●	...	●	●	●	●	●	●	●	●	...	...	...	...	●	●	●T	...	...	☰	●	●	●K	●T	...
Strathfield Turgiss	...	...	●K	●K	●	...	...	...	...	●	...	●T	●	...	●K	●	●	...	...	...	...	●T	●	●T	●☰	☰	●	●	●K	●K	●
Norwood	...	●	●K	●K	●K	...	...	...	○	●	...	●K	●	...	●	●≺	...	...	...	...	...	●	●T	●K	●	...	●	●	●T	●K	●T
Eastbourne	...	●	...	●	●K	●	...	...	●	●	●	●	●	●	●	●K	...	...	...	...	...	●	●≺	●	...	●	●≺	●	●K	●	●
Ramsgate	...	●	●K	...	●T	...	...	...	...	●	●	...	●	...	●K	●K	...	●	...	...	...	●	●	...	●	●	...	●	...	●	●K
Audley End	●	●	●T	●T	●	...	...	...	●	●K	●	●T	●	●	●	●K	...	...	●	..	...	●	●T	●T≺	K	...	●	●	●T	●T	●
Hillington	...	●	●	●K	●	●K	...	●	...	●	●	●T	●	●	●	●K	...	...	...	...	...	●	●	●K	T	...	●	...	●	●K	●T
Lowestoft	...	●	●	K	●☰	≺	...	...	...	●	●	●▲K	●	●	●K	●K	K	...	...	...	...	●	●	●	●T	●	...	●	●K	●	●

EXPLANATION OF THE SYMBOLS.—● indicates rain; ✱ snow; ▲ hail; ☰ fog; K thunderstorm; T thunder; ≺ lightning; ○ solar halo; ☋ lunar halo.

Abstract of Meteorological Observations for the Month of SEPTEMBER, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of					Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.														
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.														
Gainford	29·919	57·1	52·0	54·5	46·4	64·4	35·2	24	73·0	11	53·1	49·8	76	85	5·7	5·6	2·35	·95	17	12	0	3	7	1	4	3	0	4	5	12	11	7	14
Wakefield	·929	56·9	53·7	55·3	48·5	63·5	36·0	21	72·8	3, 11	53·7	51·7	80	86	6·6	5·2	2·55	·45	29	12	0	3	7	1	3	1	3	3	7	9	23	3	8
Kelstern	·947	56·0	52·0	54·0	47·1	62·9	36·0	26	73·4	6	53·4	50·8	83	92	6·4	4·7	1·97	·34	15	14	0	4	10	1	1	2	2	7	2	15	15	13	3
Mansfield	·949	55·3	52·1	53·7	47·9	63·0	35·5	24	71·8	4	53·0	50·5	85	89	6·4	4·4	1·54	·32	22	14	0	4	7	0	1	1	0	1	4	14	18	3	18
Buxton	·975	54·2	50·9	52·5	45·9	60·1	32·6	24	69·0	4	51·8	49·4	84	89	7·4	5·3	5·19	1·20	17	17	0	2	9	0	4	3	1	0	0	5	18	26	3
Cheadle.....	·965	54·5	52·2	53·4	47·9	60·9	38·6	20	69·3	6	52·6	51·0	87	92	6·8	4·3	2·83	·62	22	12	0	5	9	5	4	1	4	3	10	6	20	12	0
Llandudno	·943	58·9	55·5	57·2	52·4	65·2	43·0	24	73·2	5	55·1	52·8	77	83	6·8	4·4	3·75	·71	29	16	0	5	10	1	6	2	3	0	1	4	38	6	0
Chester	·946	58·3	53·9	56·1	48·5	64·6	35·3	24	73·0	3, 11	54·3	51·7	76	85	6·5	..	3·18	1·18	22	16	0	..	..	..	..	..	..	..	..	..	..	..	..
Shrewsbury (Leaton)	....	56·4	51·3	53·9	46·1	63·4	33·0	24	72·1	5	54·7	50·6	89	95	..	..	3·48	·89	8	15	0	..	..	..	3	4	0	0	1	4	24	16	8
Churchstoke.....	·997	55·6	52·4	54·0	47·1	62·6	33·9	24	71·2	11	53·1	50·5	84	87	6·8	4·6	2·45	·68	22	13	0	2	5	0	4	0	1	2	2	14	16	16	5
Hereford	·983	56·6	53·6	55·1	48·0	63·7	33·9	24	72·7	6	53·7	51·7	82	87	6·8	3·7	4·17	2·75	7	12	0	3	6	0	1	1	0	0	1	4	20	6	27
Cheltenham	·993	57·0	52·5	54·7	45·8	64·1	33·0	21	72·4	5	54·6	51·5	85	93	7·4	3·5	2·58	·59	7	15	0	3	7	1	6	0	1	0	8	11	19	9	6
Carmarthen	29·997	58·5	53·9	56·2	48·6	66·8	38·5	26	73·6	5	55·7	52·7	83	92	7·1	6·6	3·73	1·66	23	17	0	2	12	0	1	0	3	1	1	13	14	6	21
Dartmoor	30·031	54·1	51·1	52·6	46·8	58·7	38·8	26	70·0	5	52·0	50·1	86	93	7·4	5·9	5·21	1·55	22	18	0	2	10	2	0	0	8	0	3	4	11	19	15
Babbacombe.....	·035	59·7	54·3	57·0	50·2	64·7	42·0	24	71·8	8	56 0	52·8	78	90	6·5	5·0	1·73	·76	22	10	0	4	8	2	3	2	4	2	1	13	23	10	2
Downside	·011	56·6	53·6	55·1	48·8	63·5	38·9	24	72·8	11	54·7	52·6	88	93	6·4	5·5	3·03	·74	22	15	0	6	10	1	4	3	1	1	3	9	28	10	1
Marlborough	·018	57·8	53·2	55·5	47·0	65·6	32·7	24	73·4	11	54·9	52·1	82	92	6·6	4·6	1·76	·63	22	13	0	5	10	0	1	1	0	0	2	12	4	3	37
Strathfield Turgiss .	·016	57·9	53·1	55·5	45·8	66·5	30·5	24	74·9	8	54·9	52·1	81	93	6·1	4·4	·75	·24	17	8	0	5	8	0	0	0	2	2	1	16	16	10	13
Norwood	·002	57·5	54·7	56·1	48·6	65·6	37·1	24	73·4	7	54·1	52·9	79	88	5·6	3·6	·75	·16	17	10	0	9	5	3	5	0	2	1	4	6	25	5	12
Eastbourne	·013	60·2	58·2	59·2	51·1	66·9	38·9	24	73·7	7	56·0	54·9	75	80	4·8	4·4	1·99	·79	19	9	0	7	7	1	3	2	3	1	2	2	18	27	2
Ramsgate	30·017	59·6	56·7	58·2	51·5	65·0	41·1	24	73·3	6	56·3	54·7	80	87	5·4	4·8	2·04	·44	8	13	0	5	7	2	0	2	0	0	1	23	10	8	16
Audley End	29·964	58·1	53·5	55·8	46·6	64·8	32·2	24	75·1	5, 7	54·7	52·0	79	90	5·6	3·8	·97	·23	17	14	0	7	6	0	0	1	1	1	9	17	7	16	8
Hillington	·955	58·2	53·2	55·7	46·6	64·6	34·0	21	75·3	5	..	..	..	..	6·3	4·3	1·96	·35	29	13	0	4	6	2	1	1	7	0	14	9	20	3	5
Lowestoft	29·948	58·7	56·5	57·6	49·8	64·7	40·1	21	76·6	6	55·6	54·0	81	84	5·9	5·2	2·64	·64	22	14	0	8	12	1	3	1	2	4	2	7	27	11	3
Columns.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

EXPLANATION OF THE SYMBOLS.—● indicates rain; * snow; ▲ hail; ≡ fog; ⊼ thunderstorm; ⊤ thunder; ≺ lightning; ○ solar halo; ☋ lunar halo.

LIST OF THE STATIONS, WITH THE NAMES OF THE OBSERVERS, &c.

Station.	County.	Lat.	Long.	Height of Ground.	Observer.
Audley End	Essex	52° 1′ N.	0°13′ E.	154ft.	J. Bryan.
Babbacombe	Devon	50 29	3 31 W.	293	E. E. Glyde, F.M.S.
Buxton	Derby	53 14	1 54 W.	987	E. J. Sykes, F.R.A.S., F.M.S.
Carmarthen	Carmarthen	51 52	4 18 W.	188	G. J. Hearder, M.D.
Cheadle	Stafford	52 58	1 57 W.	646	J. C. Philips, J.P., F.M.S.
Cheltenham	Gloucester	51 54	2 3 W.	184	R. Tyrer, B.A., F.M.S.
Chester	Cheshire	53 12	2 53 W.	63	A. O. Walker, F.L.S., F.M.S.
Churchstoke	Montgomery	52 31	3 5 W.	549	P. Wright, F.C.S., F.M.S.
Dartmoor Prison	Devon	50 33	3 59 W.	1372	R. E. Power, L.R.C.P., F.M.S.
Downside	Somerset	51 15	2 29 W.	592	Rev. T. L. Almond, O.S.B.
Eastbourne	Sussex	50 46	0 16 E.	24	S. Bretton, F.M.S.
Gainford	Durham	54 33	1 44 W.	249	A. Atkinson.
Hereford	Hereford	52 5	2 45 W.	274	T. A. Chapman, M.D.
Hillington	Norfolk	52 48	0 33 E.	88	Rev. H. Ffolkes, F.M.S.
Kelstern	Lincoln	53 24	0 7 W.	388	D. G. Briggs, F.M.S.
Llandudno	Carnarvon	53 21	3 50 W.	79	J. Nicol, M.D., F.M.S.
Lowestoft	Suffolk	52 29	1 45 E.	85	S. H. Miller, F.R.A.S., F.M.S.
Mansfield	Notts	53 8	1 12 W.	349	W. Tyrer, F.M.S.
Marlborough	Wilts	51 25	1 43 W.	471	Rev. T. A. Preston, M.A., F.M.S.
Norwood	Surrey	51 26	0 6 W.	184	W. Marriott, F.M.S.
Ramsgate	Kent	51 20	1 25 E.	105	Rev. E. D. O'Gara, O.S.B., F.M.S.
Shrewsbury (Leaton)	Salop	52 45	2 57 W.	266	Rev. E. V. Pigott, F.M.S.
Strathfield Turgiss	Hants	51 20	1 0 W.	195	Rev. C. H. Griffith, F.M.S.
Wakefield	Yorks	53 41	1 30 W.	96	H. Clarke, L.R.C.P., F.M.S.

NOTES ON THE TABLES.

Column 1 is the mean of the readings of the Barometer at 9 a.m. and 9 p.m. corrected for temperature and reduced to sea-level.

Column 4 is the mean of the readings of the Dry-Bulb Thermometer at 9 a.m. and 9 p.m.

Columns 5 to 10. The Maximum and Minimum Thermometers are read and set at 9 p.m., and the readings entered to the same day.

Columns 13 and 14. The Relative Humidity is calculated by dividing the elastic force of vapour at the temperature of the dew-point for the month by that at the temperature of the air (*i.e.* dry-bulb reading).

Columns 15 and 16. The Amount of Cloud is estimated according to the scale 0—10, 0 representing a cloudless sky, and 10 a completely covered or overcast sky.

Columns 17 to 20. The Rain is measured at 9 a.m., and the amount entered to the previous day. A fall of ·006 in. and above constitutes a day of rain.

Column 21. When any Snow falls it is entered as a day of snow.

Columns 22 and 23. When the mean of the 9 a.m. and 9 p.m. observations of the amount of Cloud is less than 2·0, this is called a day of clear sky, but when the mean is above 8·0 it is called an overcast day.

Column 24. When the Force of the Wind is 7 and above (on the scale 0—12) this is counted as a gale.

Columns 25 to 33 give the sums of the observations of the Direction of the Wind at 9 a.m. and 9 p.m.

Report on the Meteorology of England for the Quarter ending DECEMBER 31ST, 1878, *with Monthly Abstracts of the Observations made at the Society's Stations.* By WILLIAM MARRIOTT, Assistant-Secretary.

ATMOSPHERIC PRESSURE was below the average for the quarter.

In *October* the mean, reduced to sea-level, was 29·76 in., which is ·22 in. below that of September, the highest being in the S and SE, and the values decreasing towards the N and NW. The maximum occurred in the N on the 2nd, and at the other stations on the 12th or 13th, the highest being 30·366 in. at Buxton at 9 a.m. on the 2nd, and 30·393 in. at Ramsgate at 9 a.m. on the 13th; while the minimum took place at most stations on the 26th, the lowest, however, was 28·901 in. at Llandudno at 9 a.m. on the 10th.

In *November* the mean was 29·79 in., which is ·03 in. above that of the preceding month, the highest being in the W and the lowest in the E. The maximum readings occurred at all stations on the evening of the 19th, the highest being 30·579 in. at Churchstoke; the minimum took place in the N on the 10th and in the E on the 15th, the lowest being 29·116 in. at Gainford at 9 p.m. on the 10th, and 28·925 in. at Lowestoft at 9 p.m. on the 15th.

In *December* the pressure was low, but much more uniform than in the two preceding months; the mean was 29·73 in., which is ·06 in. below that of November. The readings followed the same order as in the previous month—viz. the highest being in the W and the lowest in the E. The maximum occurred in the W on the 4th, and at the other stations on the 24th, the highest being 30·388 in. at Llandudno at 9 a.m. on the 4th, and 30·413 in. at Buxton at 9 p.m. on the 24th; the minimum took place at most stations on the 18th or 19th, the lowest being 28·977 in. at Wakefield at 9 p.m. on the 18th.

AIR TEMPERATURE was much below the average for the quarter.

In *October* the mean temperature was 49°·7*, or 6°·1 below that of September, and varied from 46°·8 at Buxton, and 47°·2 at Cheadle, to 59°·3 at Eastbourne and 52°·3 at Ramsgate. The weather was mild till the 21st, but cold during the remainder of the month. The maximum was registered at most stations on the 5th, the highest being 74°·2 at Strathfield Turgiss and 78°·7 at Norwood; the minimum occurred on the 30th or 31st, the lowest being 26°·1 at Hillington on the 31st. The mean daily range was 12°·6.

In *November* the mean temperature was 37°·8, or 11°·9 below that of October; and varied from 34°·9 at Cheadle and 35°·3 at Buxton to 41°·6 at Llandudno and 41°·5 at Ramsgate. The weather was cold throughout the month, the only warm days being the 10th, 24th, and 25th. The maximum took place in the N and W on the 10th, and in the S and E on the 25th, the highest being 54°·1 at Carmarthen on the 10th, and 53°·1 at Audley End on the 25th. The minimum was recorded in the E on the 30th, but on various dates at the other stations, the lowest readings registered being 20°·0 at

* The mean of the 9 a.m. and 9 p.m. readings.

Cheltenham on the 29th, and 20°·2 at Hillington on the 30th. The mean daily range was 9°·7.

In *December* the mean temperature was 31°·8, or 6°·0 below that of November, and varied from 28°·2 at Kelstern to 35°·9 at Babbacombe and Eastbourne. The weather was very cold till the 25th, especially so from the 8th; but a rapid thaw set in on the 26th, and the weather continued very mild to the end of the month. The maximum occurred on the 30th or 31st, the highest recorded being 55°·1 at Strathfield Turgiss on the 30th. The minimum took place at most stations on the morning of Christmas Day. The lowest readings registered were: on the 13th—2°·0 at Gainford; on the 24th, 2°·5 at Buxton; and on the 25th—1°·0 at Gainford, 4°·8 at Cheltenham and Hereford, and 6°·9 at Hillington. The mean daily range was 10°·2.

Rainfall was above the average, and at some stations the monthly amounts were greater than those of any previous year.

In *October* the total falls and number of rainy days were in most cases large. The falls varied from 8·79 in. at Dartmoor and 6·35 in. at Downside to 1·47 in. at Norwood and 1·48 in. at Gainford. The heaviest daily falls occurred in the W on the 9th, in the NE on the 24th, and in the SE on the 25th; the greatest falls being 1·53 in. at Dartmoor on the 9th, and 1·34 in. at Eastbourne on the 25th.

In *November* the rainfall was large, especially in the E. The total falls varied from 7·59 in. at Hillington and 6·50 in. at Dartmoor to 2·16 in. at Chester and 2·29 in. at Wakefield. The greatest daily falls occurred on the 9th, 10th, 14th, and 15th, the heaviest recorded being 1·54 in. at Hillington on the 14th. Snow fell at nearly all the stations on several days during the month.

In *December* the rainfall and number of rainy days were less than in the two previous months. The total falls varied from 7·02 in. at Dartmoor and 3·21 at Babbacombe to 1·18 in. at Audley End and 1·23 in. at Norwood. The greatest daily falls occurred chiefly between the 25th and 31st, the heaviest being 1·24 in. at Dartmoor on the 28th. Snow fell frequently during the month; some of the recorded daily rainfalls are, in fact, the measurements of melted snow.

Wind.—In *October* the general direction of the wind was SW to S from the 2nd to the 12th, S to SE to the 21st, and chiefly from NW for the remainder of the month. The wind was strong in force, and gales occurred on several occasions at nearly all the stations. In *November* N winds prevailed generally throughout the month. A gale from the SW occurred on the 10th, while gales from the NW and NE also took place at several stations. In *December* the prevalent winds were N till the 9th, E till the 14th, NW and variable till the 24th, SE on the 25th, and S to SW till the end of the month. Gales were experienced on several occasions, chiefly at the close of the month, when it blew strongly from the SW.

Notes by the Observers.

Audley End, *December 26th.*—Everything completely covered with ice.

BABBACOMBE, *October*.—It was wet and stormy with a low barometer from ıe 6th to the 10th, and after the 21st; dry and fine with a high barometer ıd NE wind at the beginning and in the middle of the month. Warm eather prevailed till the 21st; then changed to cold, which became very ıvere on the 29th and 30th, when a little snow fell here, and the Dartmoor ills were covered with it. Parhelia were visible on the 12th and 25th.

November.—The first and third weeks were dry, with a high barometer; e second and last weeks wet with a low barometer and strong winds. tterly cold weather and N winds prevailed throughout the month; the only ırm days being the 10th and 24th, when SW winds and rain occurred. ıere was scarcely any sunshine during the last ten days of the month.

December.—The month has been very cold, the mean temperature being ·8 below that of December, 1877, and 10°·0 below that of December, 1876. ost occurred in the air on 18 days, and on the grass every day till the th and again on the 29th; N winds accompanied with intense cold and ow after the 9th prevailed till the 25th, when an E gale and thaw occurred lowed by strong SW winds, heavy rain and mild weather to the end of the nth. Snow fell on 11 days, it covered the ground from the 9th to the th and remained in the shade till the 25th, whilst the road and paths were ızed with ice, rendering locomotion very dangerous and causing many cidents.

CARMARTHEN, *December* 28th.—Skating on high road on this and previous ys.

CHELTENHAM, *November*.—The trees completely bare of leaves by the th.

December.—Frost set in on the 3rd, at first slight with hoar frosts, but ıdually increasing in intensity. Skating commenced on the 9th, and con-ıued without much intermission till the 25th. The early part of the frost s accompanied with dull foggy weather, but the days between the 17th and st were delightful, very sharp, bright, and calm. Snow fell heavily on the ght of the 21st, but the frost continued till the 26th, when thaw set in, a ference of 27°·2 occurring between the minimum temperatures of the 25th d 26th. The month concluded with fog, rain and wind.

DOWNSIDE, *November* 11*th*.—Chestnut, ash, and lime bare; 12th, apple d pear bare; 22nd, elms bare; 30th, sycamore bare.

December 9*th*.—An extraordinary lunar halo was seen immediately after ıset. It was cruciform in shape, the perpendicular arm of the cross pearing sooner, and being more brilliant than the transverse arm. This appeared upon the moon's leaving the low strata of clouds hanging close on the horizon.

GAINFORD, *November* 12th.—The evening of the 11th was remarkably e and clear with hard frost (28°·5 in shade and 20°·0 on grass 9 p.m.), and ıtinued so up to 11 p.m., wind NW. Soon after I observed large masses cumuli rising in the SW; I looked out at 1·30 a.m., no snow, cloud much ıreased. At 4·45 a.m. it was evident a very heavy fall had occurred. The ght watchman at Piercebridge Station, half way between Darlington and

Gainford, reported to me as follows :—"At 12·30 a.m. a little rime on the ground, 1·30 began to snow heavily and continued till 4·30 a.m. when wind increased, but snow did not drift till after 6 a.m. when it blew heavily. The train leaving Gainford at 9·47 a.m. stuck fast and was hours in reaching Darlington, although four engines were employed."

HEREFORD, *November 30th.*—Black Mountains have not been clear of snow since October 28th.

December 25th.—9 a.m. everything to minutest details of foliage clothed with about $\frac{1}{16}$ in. of pure transparent ice.

HILLINGTON, *October.*—Heliotropes still untouched at end of month till 30th. Foliage exceptionally abundant.

November.—The largest amount of rain registered in any one month for 12 years; the mean for November during the same period is 2·93 in. Fields under water on the 14th.

December.—The moisture of the atmosphere exceeded anything I have ever seen during the great cold. One's hair and beard were full of drops, which soon became balls of ice. Ground covered with snow from 8th-28th; thaw extraordinarily rapid, the ground was covered with snow on the evening of the 28th and not a vestige was left a.m. 29th.

KELSTERN, *November.*—This has been the wettest month I have ever recorded.

LOWESTOFT, *December.*—The ground was completely sealed with frozen snow from the 9th to the 26th, and many birds died of cold and hunger, especially starlings and thrushes. Flocks of starlings stripped the holly trees of their berries.

MANSFIELD, *December.*—The month has been remarkable for its low temperature: frost set in about the 8th and continued with very little intermission till the 25th, the thermometer scarcely rising above freezing point. The ground was covered with snow from the 11th to the 26th. From the 10th to the 14th was remarkable for the heavy rimes, which covered every object very thickly and remained throughout the period.

NORWOOD, *October 9th.*—Prismatically coloured mock moons on W and E sides of true Moon at 6·50 p.m.

CORRECTIONS, &c.

HEREFORD, *May.*—The rainfall should be 4·78 in. instead of 4·68 in.

WAKEFIELD, *March.*—The rainfall should be 0·74 in. instead of 0·76 in.

IST OF THE STATIONS, WITH THE NAMES OF THE OBSERVERS, &c.

Station.	County.	Lat.	Long.	Height of Ground.	Observer.
End	Essex	52° 1′ N.	0°13′ E.	154ft.	J. Bryan.
ombe	Devon	50 29	3 31 W.	293	E. E. Glyde, F.M.S.
	Derby	53 14	1 54 W.	987	E. J. Sykes, F.R.A.S., F.M.S.
then	Carmarthen	51 52	4 18 W.	188	G. J. Hearder, M.D.
e	Stafford	52 58	1 57 W.	646	J. C. Philips, J.P., F.M.S.
ham	Gloucester	51 54	2 3 W.	184	R. Tyrer, B.A., F M.S.
r	Cheshire	53 12	2 58 W.	68	A. O. Walker, F.L.S., F.M.S.
stoke	Montgomery	52 31	3 5 W.	549	P. Wright, F.C.S., F.M.S.
or Prison	Devon	50 33	3 59 W.	1372	R. E. Power, L.R.C.P., F.M.S.
de	Somerset	51 15	2 29 W.	592	Rev. T. L. Almond, O.S.B.
rne	Sussex	50 46	0 16 E.	24	S. Bretton, F.M.S.
d	Durham	54 33	1 44 W.	249	A. Atkinson.
d	Hereford	52 5	2 45 W.	274	T. A. Chapman, M.D.
ton	Norfolk	52 48	0 33 E.	88	Rev. H. Ffolkes, F.M.S.
n	Lincoln	53 24	0 7 W.	388	D. G. Briggs, F.M.S.
dno	Carnarvon	53 21	3 50 W.	79	J. Nicol, M.D., F.M.S.
oft	Suffolk	52 29	1 45 E.	85	S. H. Miller, F.R.A.S., F.M.S.
ld	Notts	53 8	1 12 W.	349	W. Tyrer, F.M.S.
rough	Wilts	51 25	1 48 W.	471	Rev. T. A. Preston, M.A., F.M.S.
d	Surrey	51 26	0 6 W.	184	W. Marriott, F.M.S.
te	Kent	51 20	1 25 E.	105	Rev. E. D. O'Gara, O.S.B., F.M.S.
bury (Leaton)	Salop	52 45	2 57 W.	266	Rev. E. V. Pigott, F.M.S.
ield Turgiss	Hants	51 20	1 0 W.	195	Rev. C. H. Griffith, F.M.S.
eld	Yorks	53 41	1 30 W.	96	H. Clarke, L.R.C.P., F.M.S.

NOTES ON THE TABLES.

mn 1 is the mean of the readings of the Barometer at 9 a.m. and 9 p.m. ted for temperature and reduced to sea-level.

mn 4 is the mean of the readings of the Dry-Bulb Thermometer at 9 a.m. p.m.

mns 5 to 10. The Maximum and Minimum Thermometers are read and set m., and the readings entered to the same day.

mns 13 and 14. The Relative Humidity is calculated by dividing the elastic of vapour at the temperature of the dew-point for the month by that at nperature of the air (*i.e.* dry-bulb reading).

mns 15 and 16. The Amount of Cloud is estimated according to the scale 0 representing a cloudless sky, and 10 a completely covered or overcast

mns 17 to 20. The Rain is measured at 9 a.m., and the amount entered previous day. A fall of ·006 in. and above constitutes a day of rain.

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mn 24. When the Force of the Wind is 7 and above (on the scale 0—12) counted as a gale.

mns 25 to 33 give the sums of the observations of the Direction of the at 9 a.m. and 9 p.m.

Abstract of Meteorological Observations for the Month of October, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of					Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.														
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.														
Gainford	29·715	48·7	47·5	48·1	42·7	55·9	29·6	29, 30	67·2	3	47·1	46·1	88	89	7·6	6·4	1·48	·45	9	16	0	0	11	1	7	3	4	8	7	11	3	9	10
Wakefield	·723	49·6	48·6	49·1	43·0	56·0	31·2	30	67·6	5	47·5	46·4	85	84	7·6	6·9	2·20	·45	24	18	0	0	12	0	1	3	5	8	12	9	11	5	8
Kelstern	·748	49·6	46·7	48·2	43·3	55·3	27·3	30	66·8	5	47·8	45·6	87	92	6·5	4·7	2·37	·60	24	17	0	0	5	8	3	3	3	6	10	14	12	7	6	1
Mansfield	·742	48·3	46·5	47·4	42·5	55·9	30·0	30	70·8	5	47·0	45·5	90	92	6·5	4·6	2·93	·63	24	20	0	6	10	0	2	0	3	2	14	13	6	3	19
Buxton	·761	47·4	46·1	46·8	42·3	52·7	27·0	2, 29	67·8	5	45·9	44·6	88	88	7·4	6·8	5·94	·87	10	21	2	0	8	1	0	0	3	10	0	14	14	17	4
Cheadle.	·739	47·3	47·1	47·2	42·8	54·0	29·2	30	67·0	5	46·2	46·1	91	92	7·1	6·2	3·35	·54	25	18	2	3	13	10	3	2	7	15	13	11	4	7	0
Llandudno	·693	53·0	51·0	52·0	47·5	59·3	37·0	29	73·0	5	49·8	48·6	79	83	6·3	6·8	3·78	·58	9	18	0	4	12	2	3	1	1	5	7	15	24	6	0
Chester	·714	50·4	49·5	50·0	44·6	57·0	31·9	2	66·8	3	48·3	47·5	85	86	..	..	2·94	·57	9	24	0	..	..	..	..	..	..	..	..	..	..	..	..
Shrewsbury (Leaton)	·747	49·2	47·7	48·4	42·3	55·8	29·8	31	67·0	6	48·5	47·2	94	96	..	..	4·30	·60	6	21	1	..	..	0	0	0	1	7	6	13	7	2	26
Churchstoke.....	·749	49·5	48·3	48·9	43·9	55·5	31·0	30	67·8	5	47·7	46·8	86	89	7·1	7·4	4·55	·90	9	21	1	0	9	2	4	3	5	19	5	11	7	7	1
Hereford	·748	50·4	48·3	49·4	44·2	56·9	33·6	31	70·1	5	48·5	46·9	87	90	6·8	6·0	3·74	·79	9	22	0	5	12	2	4	3	4	7	7	3	11	5	18
Cheltenham	·769	51·4	49·0	50·2	43·9	57·1	27·4	30	71·5	5	49·7	47·9	88	92	6·1	5·5	3·39	·67	31	19	0	5	8	4	1	0	4	6	14	9	16	8	4
Carmarthen	·740	52·8	49·6	51·2	45·8	59·5	33·3	30	71·0	5	50·9	48·6	87	92	6·7	5·5	6·36	1·00	9	21	1	3	9	2	4	0	8	3	4	13	16	2	12
Dartmoor	·786	48·4	46·5	47·5	43·4	52·8	30·5	30	68·6	5	47·2	45·7	91	94	7·1	7·6	8·79	1·53	9	23	2	1	15	7	3	1	10	4	9	8	7	16	4
Babbacombe.....	·791	53·8	50·6	52·2	47·3	58·5	32·0	30	65·9	1, 4	51·4	48·9	84	88	5·9	6·4	3·46	·73	9	17	2	3	8	11	3	6	5	3	8	11	17	6	3
Downside	·774	50·7	48·2	49·4	44·4	56·3	32·2	30	70·9	5	49·0	47·1	88	91	6·1	6·0	6·35	·98	10	15	1	3	10	5	2	5	4	5	4	22	10	8	2
Marlborough	·793	50·4	48·4	49·4	43·7	58·1	30·9	30	72·6	5	48·6	47·2	87	91	6·6	6·4	4·01	·83	9	16	0	1	11	0	1	1	3	0	8	14	6	1	28
Strathfield Turgiss..	·796	51·8	48·1	50·0	42·4	59·3	30·0	13	74·2	5	50·0	47·3	88	94	6·4	5·5	3·03	·66	19	13	1	4	9	2	0	0	5	3	6	12	11	11	14
Norwood	·791	51·8	49·9	50·8	44·9	58·6	31·5	30	73·7	5	49·4	47·9	84	86	6·1	5·9	1·47	·25	25	13	1	2	7	2	0	3	6	0	12	13	11	4	13
Eastbourne	·807	53·8	52·8	53·3	47·5	58·9	33·1	31	67·0	5	51·3	50·0	83	81	6·8	5·8	3·68	1·34	25	13	0	2	10	4	6	4	5	4	2	8	20	12	1
Ramsgate	·820	53·2	51·5	52·3	47·3	58·1	30·8	30	66·3	3	50·6	49·5	83	86	6·8	5·0	3·67	1·12	25	15	1	2	7	2	0	3	6	3	16	11	16	3	4
Audley End	·760	50·7	47·8	49·3	43·2	58·1	31·5	30	72·0	5	48·9	46·8	88	92	6·3	4·1	2·41	·68	21	17	1	3	6	0	0	3	4	4	10	17	3	15	6
Hillington	·765	50·8	47·7	49·2	42·8	58·3	26·1	31	71·6	5	49·1	46·7	88	92	7·0	4·7	2·86	·68	24	16	1	4	10	0	1	1	9	5	13	19	3	11	0
Lowestoft	29·775	52·2	51·2	51·7	46·7	57·1	29·0	30	64·8	5	49·6	48·3	83	80	7·1	4·6	1·80	·31	1	14	0	2	9	1	1	0	6	9	9	10	18	8	1
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

DATE.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Gainford	...	●	...					●ψ	●	●	●	●ψ	...	ψ				●					...	...	...	●	●	●	...	●	...	...	...	...	...	●
Wakefield	...	|||	●	...	●	●	...	●	●	●	ψ	...	...	●	...	...	...	...	●	...	●	●	●	...	●	...	...	...	●	...	●
Kelstern	...	●	...	●	...	●	●	...	●	●	●	...	...	...	●	...	...	...	...	●					●	●	...	●	...	●	...	●
Mansfield	...	|||	●	...	●	●	...	●	●	T	...	...	...	|||	...	...	...	●	●	●	●	T	●	...	●	...	●	...	●
Buxton	...	|||	●	|||	●	●	...	●	●	●	ψ	...	|||	...	...	|||	●	●	●	●	●	●	●	●	●	●	●
Cheadle	...	●	...	|||	|||	●	...	|||	●	●	...	...	...	...	...	|||	●	●	●	●	●	|||	●	●	●	●
Llandudno	...	|||	...	...	●	●	●	●	●	●	...	...	...	...	...	...	...	●	●	...	●	●	●	●	●	●	●	●	●	●	●
Chester	...	●	...	●	...	●	●	●	●	●	●	...	...	...	...	●					●	...	...	●	●	●	●	●	●	●	●	...	●
Shrewsbury (Leaton)	...	|||	...	●	...	●	●	...	●	●	ψ	ψ	...	ψ	|||	●	...	...	...	●	●	●	●	●	●	●	●	●	●
Churchstoke	...	●	...	●	...	●	●	|||	●	●	...	...	...	...	|||	|||	...	...	●	●	●	●	●	●	●	●	●	●
Hereford	...	●	...	|||	●	●	●	●	●	●	...	...	...	|||	|||	|||	...	●	●	●	●	●	●	●	●	●	●	●
Cheltenham	...	●	...	●	...	|||	●	●	●	ψ	...	...	...	|||	|||	...	...	●	●	●	●	●	●	●	●	●	●	●
Carmarthen	...	|||	...	●	ψ	●	●	●	●	ψ	...	...	...	...	...	...	...	...	...	●	●	●	●	●	●	●	●	●	●	●	●
Dartmoor	...	●	...	●	...	●	|||	|||	●	...	...	...	|||	|||	|||	|||	●	●	●	●	●	●	●	●	●	●	●
Babbacombe	...	...	...	●	...	●	●	●	●	●	○	○	ψ	...	...	...	...	...	|||	|||	●	●	●	●	●	●	●	●	●	●
Downside	...	...	...	...	...	●	●	●	●	●	ψ	...	...	...	○	|||	|||	|||	●	●	●	●	●	●	●	●	●	●
Marlborough	...	...	...	...	...	●	●	...	●	●	ψ	...	...	...	|||	|||	|||	|||	●	●	●	●	●	●	●	●	●	●
Strathfield Turgiss	...	|||	...	ψ	●	●	●	●	●	ψ	...	...	...	...	...	|||	...	...	...	●	●	●	●	●	●	●	●	●	●	●
Norwood	...	|||	...	|||	●	○	●	●	ψ	...	ψ	...	...	○	|||	●	|||	●	●	●	●	●	●	●	●	●	●	●
Eastbourne	..	●	...	...	ψ	●	●	●	●	Tψ	ψ	...	...	...	...	...	...	...	●	...	●	●	●	●	●	●	●	●	●	●	●	●
Ramsgate	...	●	...	...	●	●	...	●	●	●	...	...	...	...	...	...	...	...	...	...	●	●	●	●	●	●	●	●	●	●	●	●
Audley End	...	|||	...	...	●	...	●	●	●	...	...	|||	...	...	...	...	|||	●	●	●	●	●	●	●	●	●	●	●	●
Hillington	...	●	...	...	...	●	...	●	●	●	...	...	●	...	...	...	...	...	...	●	●	●	●	●	●	●	●	●	●	●	●	●
Lowestoft	...	●	...	...	...	●	●	...	...	●	...	...	...	...	...	...	●	...	...	...	●	|||	●	●	●	|||	●	●	●	●

EXPLANATION OF THE SYMBOLS.—● indicates rain; * snow; ▲ hail; ≡ fog; ⊠ thunderstorm; T thunder; ≺ lightning; ○ solar halo; ψ lunar halo.

Abstract of Meteorological Observations for the Month of NOVEMBER, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of					Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.														
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.														
Gainford	29·799	36·8	36·3	36·6	32·4	42·1	24·0	20	49·8	10	35·8	35·3	91	91	5·7	6·1	6·14	1·12	15	20	4	5	8	2	13	11	1	2	1	3	7	13	9
Wakefield	·776	37·7	37·4	37·5	33·2	43·0	25·2	20	48·9	10	36·1	35·9	86	87	6·8	6·8	2·29	·32	11, 24	19	4	0	9	0	8	1	1	1	2	4	14	24	5
Kelstern	·746	36·1	35·8	35·9	32·1	41·5	26·9	12	49·6	19	35·4	35·2	93	94	6·9	6·1	6·09	1·34	15	21	2	3	9	0	14	5	1	1	3	9	5	20	2
Mansfield	·775	36·6	35·2	35·9	32·6	41·8	24·9	21	47·6	2	35·5	34·4	90	92	7·0	5·7	2·43	·51	9	15	4	2	10	0	13	2	0	0	0	10	3	16	16
Buxton	·812	35·6	35·0	35·3	30·7	40·3	22·6	20	47·5	1	34·0	33·6	85	86	7·0	7·9	4·60	·97	9	12	8	0	11	0	10	8	4	1	0	0	5	23	9
Cheadle..	·790	34·8	35·0	34·9	31·5	40·6	23·8	21	46·7	2, 18	34·0	34·4	92	94	6·5	5·6	2·37	·56	15	11	5	4	12	9	22	5	4	1	8	5	0	15	0
Llandudno	·824	41·9	41·4	41·6	37·2	45·9	30·8	22, 26	52·2	10	39·2	38·7	79	79	6·6	6·5	3·32	·82	9	16	4	0	11	8	18	7	5	2	8	3	11	6	0
Chester	·804	37·1	37·7	37·4	33·1	43·4	24·8	26	50·9	10	35·5	35·8	86	84	..	..	2·16	·38	11	16	3	..	..	1	22	3	2	0	10	2	1	6	14
Shrewsbury (Leaton)	·821	35·8	35·4	35·6	31·8	41·6	23·7	26	50·6	10	35·3	35·0	95	96	6·9	4·9	3·19	·66	9	18	4	3	9	0	22	3	1	3	3	1	7	2	18
Churchstoke.....	·856	35·7	36·0	35·8	31·5	41·6	23·3	12	52·1	10	34·9	34·8	92	89	7·1	7·3	4·13	1·18	9	17	6	0	11	1	23	4	0	2	3	3	9	16	0
Hereford	·807	37·8	36·5	37·1	33·4	43·3	25·9	27	53·2	10	36·1	35·1	85	87	7·2	4·9	2·41	·52	9	17	2	3	9	0	14	8	0	0	1	0	4	8	25
Cheltenham	·804	37·5	36·9	37·2	32·0	42·4	20·0	29	51·2	10	36·3	35·8	89	90	8·4	7·7	3·00	·64	10	16	2	1	16	2	28	2	3	1	4	3	5	8	6
Carmarthen	·830	40·1	38·3	39·2	34·0	46·5	25·7	26	54·1	10	38·7	37·6	88	94	5·0	5·2	4·68	1·42	9	19	2	7	6	0	17	2	6	0	0	2	3	8	22
Dartmoor	·822	35·3	35·8	35·5	32·4	40·4	26·9	29	48·6	24	34·4	35·0	91	92	6·9	6·0	6·50	1·31	10	21	8	4	11	4	15	15	1	4	1	4	1	11	8
Babbacombe.....	·818	40·8	40·3	40·5	37·0	46·1	31·0	12	52·9	24	39·0	38·5	85	86	7·3	5·6	3·26	·52	10	17	3	3	13	4	22	12	2	2	1	3	9	9	0
Downside	·805	36·9	37·4	37·2	34·0	42·2	27·7	23	51·9	24, 25	35·8	36·2	90	89	7·7	7·6	3·99	·93	10	17	3	1	18	3	10	16	1	2	0	2	11	18	0
Marlborough	·802	36·9	37·1	37·0	33·3	43·6	25·0	23	52·0	25	35·9	36·1	91	91	7·4	6·7	3·63	·80	10	15	7	4	17	0	10	2	0	0	0	3	8	6	31
Strathfield Turgiss .	·780	38·8	37·9	38·3	38·6	44·3	24·2	23	52·1	24, 25	37·6	37·0	90	92	7·6	7·3	3·74	·82	10	16	1	2	16	0	11	8	2	2	1	4	8	18	6
Norwood	·758	39·0	39·2	39·1	35·2	43·7	27·7	30	52·6	25	37·6	37·8	88	89	7·7	7·9	3·98	1·10	27	17	3	1	17	3	13	12	3	1	1	5	7	13	5
Eastbourne	·742	41·1	41·0	41·0	36·9	46·0	30·2	30	52·6	25	39·4	39·5	86	88	7·2	7·3	3·12	·58	10	19	0	3	16	2	10	14	4	0	1	4	10	15	2
Ramsgate	·745	41·5	41·5	41·5	37·7	45·5	28·4	30	52·4	25	39·9	40·1	87	89	7·5	7·7	5·08	1·25	15	18	0	0	14	2	2	11	1	2	4	12	10	14	4
Audley End	·715	37·9	38·1	38·0	33·9	43·5	21·0	30	53·1	25	36·9	37·1	91	91	8·4	7·8	5·27	1·31	14	22	5	0	18	1	5	8	0	3	0	7	1	27	9
Hillington	·721	39·3	38·6	39·0	34·3	44·5	20·2	30	51·2	25	38·2	37·8	91	93	8·1	7·9	7·59	1·54	14	23	1	0	15	4	8	13	2	2	3	7	5	19	1
Lowestoft	29·693	41·7	40·3	41·0	36·9	45·8	30·5	30	52·3	25	40·2	38·9	87	88	7·9	7·8	6·34	1·34	15	20	1	0	16	3	4	9	8	1	1	4	13	20	0
Columns.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

Phenomena observed at the Stations during NOVEMBER, 1878.

DATE.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Gainford	●	...	...	●	...	●	●	●✱	●	●	●	✱	●	●	●	●	●	...	...	☰	☰	●☰	●	●	...	●	●✱	●✱	...	●
Wakefield	●	...	≺	●	...	●	●✱	●	●	●✱	●✱ ⊼	●	...	●	●	●	●	..	ψ☰	☰	●☰	☰	...	●✱	≺	●☰	●☰	●	...	●
Kelstern	●	●	...	●	●	●	●	●	●	●	●✱	●✱	●	●	●	●	●	●▲	●☰	☰	...	☰	...	●☰	☰	☰	●☰	...	...	●
Mansfield	...	●	...	●	...	...	●	●✱	●	●	●✱	●✱	...	●	●	...	●	...	☰	☰	☰	...	●	●✱	...	☰	●	...	☰	●
Buxton	●	...	...	...	●	...	●	●✱☰	●✱	●T	●✱	●✱	...	●✱	●	...	●	...	☰	☰	☰	▲☰	☰	●✱	☰	▲☰	✱☰	✱	...	☰
Cheadle	...	✱	☰	...	...	..	●	●✱	●	●	●✱	✱☰	...	●	●	...	●	...	...	☰	☰	...	☰	●✱	☰	☰	●☰	...	...	●☰
Llandudno	●	●	●	...	...	...	●	●▲	●	●	●✱▲	●✱▲	▲	●	●	...	...	...	☰	☰	☰	☰	☰	●✱☰	☰	●	●	✱	●	●☰
Chester	●	...	...	...	...	...	●	●▲	●	●	●✱	●✱▲	●	●	●	...	...	...	●☰	...	...	...	●	●✱	...	...	●	...	●	●
Shrewsbury (Leaton)	●	●✱	...	...	●	●	●	●	●	●	●✱	✱	...	●	●	●	●	...	☰	☰	☰	...	●	●✱	☰	☰	●☰	...	●	●☰
Churchstoke	●	✱	...	☰	●	✱☰	●	●✱	●	●	●✱☰	●✱☰	☰	●	●	☰	●☰	☰	☰	☰	☰	☰	●☰	●✱	●	☰	●☰	☰	●	●☰
Hereford	●	...	●	...	●	●	●	●	●	●	●✱	☰	...	●	●	●	...	☰	☰	☰	...	☰	●✱☰	●☰	...	...	●	...	●	●☰
Cheltenham	●	...	☰	...	...	...	●	...	●	●	●✱	●✱	...	●	●	...	●	...	●	...	...	...	●	●	●☰	☰	●	...	●	●
Carmarthen	●≺	...	●	●	●	●	●	●	●▲⊼	●✱	●✱	...	≺	●	●	●	...	...	...	☰	...	...	●	●	☰	●	●	...	●	●
Dartmoor	●✱	✱	●	●☰	●	●	●	●✱▲	●✱	●	●▲	●✱	...	●	●☰	●✱	●	...	☰	...	☰	...	●	●☰	●	...	●	●✱	●✱☰	☰
Babbacombe	●≺	...	...	●▲	●	...	●ψ	●▲	●	●	●✱	●✱≺	○	...	●○	●	...	...	...	...	...	...	●	●☰	●	...	●	●✱	●○	...
Downside	●✱	...	...	●	●	ψ	●	●	●	●	●✱	...	●	●	●	...	●	...	...	...	...	...	●	●☰	●	...	●	✱	...	●
Marlborough	...	...	...	...	✱	✱	●	●✱	●	●	●	✱	●	●✱	●	...	●	...	...	...	...	...	●☰	●	●	☰	●✱	...	●✱	●
Strathfield Turgiss ..	...	...	☰ψ	☰	☰	ψ	●ψ	●○	●	●	▲	☰○ψ	●☰	●	●	...	●	...	●☰	☰	...	...	●☰○	●☰	●☰	●☰	●✱☰	●	...	●☰
Norwood	☰○	☰○	☰ψ	☰ψ	...	✱	●	●	●ψ	●	●	☰○ψ	●✱☰	●	●	●	●	☰	☰	☰	...	☰	●○	●	●	●☰	●✱▲	●	☰	●☰
Eastbourne	≺	≺	...	●	...	...	●	●T	●	●T	●▲T	●▲	●	●	●	...	●	●	...	...	...	...	●	●	●	●	●	●	...	●
Ramsgate	T≺	●≺	...	●	●▲	●	...	●	●	●	●	...	●☰	●▲	●	●	●	...	...	...	...	...	●	●	...	●☰	●	●	...	☰
Audley End	...	●▲≺	...	●	●	●	●	●✱	●☰	●	●✱	☰	●✱	●✱	●	●	●	●	☰	☰	...	...	●	●	●	●	●✱	●	☰	●
Hillington	●ψ	●	●	●ψ	●▲	●	●	●	●▲	●	●	●✱	●	●	●	●	●	...	●	☰	...	...	●	●	●	...	●	...	...	●☰
Lowestoft	●	...	●ψ	▲ψ	●	●	●	●	●	●	●	●✱	●	●▲⊼	●	●	●	...	...	...	...	...	...	●	●	●	●	●	...	...

EXPLANATION OF THE SYMBOLS.—● indicates rain; ✱ snow; ▲ hail; ☰ fog; ⊼ thunderstorm; T thunder; ≺ lightning; ○ solar halo; ψ lunar halo.

Abstract of Meteorological Observations for the Month of DECEMBER, 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.									Wet Bulb Therm.		Relative Humid.		Amount of Cloud.		Rainfall.			Weather, No. of days of					Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.														
	In.	°	°	°	°	°	°		°		°	°	o/o	o/o			In.	In.														
Gainford	..	28·4	29·8	29·1	22·4	35·3	—2·0	13	50·3	31	27·6	29·1	85	89	5·7	5·1	2·46	·72	25	18	10	3	7	2	7	5	4	1	0	5	9	18	13
Wakefield	29·694	31·8	32·1	32·0	27·2	36·8	10·8	25	52·8	31	30·9	31·1	89	87	6·4	5·8	1·29	·56	25	16	5	2	7	1	9	3	2	2	3	6	19	10	8
Kelstern	·703	28·1	28·4	28·2	23·5	34·4	11·8	14	50·8	31	27·8	28·1	95	94	5·6	5·2	2·03	·40	25	20	16	7	10	1	11	3	2	3	4	12	10	16	1
Mansfield	·714	30·1	29·7	29·9	24·9	35·7	7·8	25	51·7	31	..	..	..	..	5·8	5·7	1·80	·62	31	13	7	4	6	0	8	2	0	2	2	12	8	9	19
Buxton	·735	30·1	29·4	29·7	..	35·0	2·5	24	48·5	31	29·2	28·5	86	84	6·4	6·9	2·96	·63	6	11	10	0	11	3	15	5	3	0	0	2	8	20	9
Cheadle	·717	29·4	30·4	29·9	26·3	34·5	16·9	14	50·1	31	29·2	30·0	96	94	6·7	5·2	2·55	·43	18	13	11	3	10	3	22	2	10	3	1	9	2	12	1
Llandudno	·718	35·6	35·6	35·6	31·2	40·4	20·7	13	53·0	31	33·9	33·8	85	84	5·9	5·2	1·96	·30	19	19	12	6	9	2	13	8	5	6	5	5	13	7	0
Chester	·705	30·7	32·0	31·3	26·8	36·8	9·4	24	53·0	31	30·0	31·1	88	88	..	..	2·92	·74	14	16	8	..	..	1	11	0	1	3	5	2	10	6	24
Shrewsbury (Leaton)	·739	29·8	30·8	30·3	24·8	35·5	7·1	25	52·3	31	29·3	30·2	89	91	5·8	4·2	1·69	·29	26	17	9	8	8	0	11	0	1	8	2	1	19	6	14
Churchstoke	·770	30·8	31·5	31·2	25·5	36·7	12·2	24, 25	51·1	30, 31	29·9	30·5	87	86	6·9	7·2	2·61	·56	28	17	11	0	8	1	19	0	6	2	1	10	11	13	0
Hereford	·731	31·0	31·4	31·2	26·2	37·5	4·8	25	53·1	31	..	..	..	..	5·6	5·2	2·02	·40	28	15	7	5	6	1	7	5	2	0	1	4	4	6	33
Cheltenham	·738	31·3	30·6	31·0	24·7	36·4	4·8	25	53·5	30	30·8	29·9	93	89	8·0	5·4	1·90	·50	25	12	5	3	12	1	12	7	6	3	4	5	12	4	9
Carmarthen	·740	32·0	32·1	32·0	25·7	39·6	11·6	12	54·7	31	31·6	31·5	95	92	6·3	4·1	2·75	·51	28	18	5	8	8	1	10	1	7	1	3	3	5	2	30
Dartmoor	·754	31·3	31·6	31·5	27·2	37·0	15·0	10	48·8	30	31·1	31·3	97	96	5·5	5·4	7·02	1·24	28	20	10	7	11	4	6	8	6	5	3	2	10	4	18
Babbacombe	·756	35·8	36·0	35·9	31·4	41·9	20·6	11, 15	52·8	30	34·8	34·8	90	89	6·5	6·5	3·21	·65	25	18	11	4	14	5	12	7	4	1	2	12	12	9	3
Downside	·746	32·0	32·5	32·2	28·1	37·2	14·8	25	51·9	30	31·6	32·0	94	94	6·8	5·2	2·45	·45	25	13	4	6	12	1	8	8	2	4	1	19	7	13	0
Marlborough	·755	31·4	31·4	31·4	27·5	37·9	14·0	25	53·7	31	31·1	31·1	97	95	7·3	6·3	2·07	·64	25	11	7	5	16	0	7	1	0	0	1	7	7	1	38
Strathfield Turgiss ..	·742	32·7	31·9	32·3	26·5	37·9	8·2	25	55·1	30	32·1	31·2	92	92	8·0	6·5	1·49	·42	26	12	7	2	15	0	3	2	1	3	1	15	5	19	13
Norwood	·734	33·1	33·4	33·3	29·3	37·1	13·0	25	54·5	30	32·3	32·4	91	88	7·7	6·5	1·23	·20	31	15	7	3	15	1	11	4	8	2	3	9	11	9	5
Eastbourne	·736	35·9	35·9	35·9	30·9	39·9	21·9	15	53·0	30	34·8	35·0	89	91	7·7	6·9	2·95	·45	27	14	5	3	16	1	13	2	1	3	0	6	12	23	2
Ramsgate	·744	35·2	34·9	35·1	30·5	39·0	19·1	25	53·7	30	34·3	34·0	91	91	8·0	6·5	2·59	·47	16	19	12	1	18	2	0	7	3	0	5	14	15	11	7
AudleyEnd	·689	31·9	32·4	32·1	27·4	36·6	10·0	25	54·1	30	31·2	31·8	91	92	8·3	6·6	1·13	·26	27	14	15	2	18	0	3	6	0	4	1	15	7	17	9
Hillington	·693	31·4	29·4	30·4	24·6	35·9	6·9	25	53·4	31	30·9	28·9	93	91	9·0	6·5	2·02	·38	25	20	15	1	17	1	8	3	4	8	1	12	8	18	0
Lowestoft	29·683	32·4	32·6	32·5	27·6	37·6	15·8	25	54·2	30	31·7	31·9	91	92	7·6	6·5	1·99	·29	27	19	7	2	14	2	2	4	3	2	4	5	26	15	1
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

DATE.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Gainford ..	●	...	...	●	...	●*	●*	●*	●*	●*	*	≡	≡	...	...	●	●	●*	●*	●*	●*	...	...	≡	●*	≡	≡	●	●	●	●
Wakefield ..	●	...	●	●	●	●	...	...	*ψ	...	●	...	≡	●	ψ	...	●	●*	...	...	...	*	...	≡	●*	●*	...	●	●	●	●
Kelstern	●≡	≡	●	...	●≡	●○	●≡	●*	...	●≡	●≡	≡	≡	≡	≡	≡	●	●*	●*	●≡	●*	*	...	≡	●≡	≡	●≡	●≡	...	...	●
Mansfield ..	●	...	...	≡	●≡	●*	*	...	...	ψ	●*	...	...	≡	...	≡	●	●*	●*	...	●*	●*	...	...	●*	●≡	●	*	...	●	●
Buxton	●	*	...	...	...	●	...	●*	...	▲	...	...	...	...	●*	...	●*	●*	●*	▲	●*	●*	...	...	*	≡	...	...	●≡	...	●
Cheadle	●≡	≡	...	...	≡	●*	≡	...	...	≡	*≡	≡	...	●≡	*	≡	●*	●*	...	≡	●≡	●*	...	...	●≡	●≡	●≡	●≡	●	●	●
Llandudno..	●	...	≡	●	...	●*	*	...	●*	*	●	*	...	●	●*	●*	●*	●▲	●▲	●*	●*	●▲	●*	●*	●≡	≡	●≡	●≡	●	●	●
Chester	●	...	...	...	...	●	*	...	...	...	...	...	...	●	●*	≡	●*	●	●*	≡	●*	●≡	●▲	...	●*	●*	●≡	●≡	...	...	●
Shrewsbury	●	...	...	●	...	●*	...	...	≡	...	...	T	...	...	●≡	●≡	●≡	●	●*	≡	●*	●*	●*	...	●*	●≡	●≡	●≡	●	●	●
Churchstoke	●*	...	≡	≡	≡	●≡	≡	...	...	≡	*≡	≡	≡	≡	●≡	●≡	●	●*	●*	...	●	●≡	●*	≡	●≡	●≡	●≡	●≡	●	●	●
Hereford ..	●	...	...	...	...	...	...	...	...	...	●≡	≡	≡	≡	...	●*	●	●	...	...	●*	*	●*	≡	●≡	●≡	●≡	●≡	●	●	●
Cheltenham	●	...	...	ψ	●ψ	●	*	...	...	...	≡	...	...	...	...	≡	...	...	...	...	●	●*	●*	≡	●*	●≡	●≡	●≡	●	●	●
Carmarthen	●▲	...	...	●	●	●	●*	●*	...	...	...	...	...	●*	...	...	●	...	...	●*	●	...	●*	...	●	●	●	●	●	●	●
Dartmoor ..	●≡	...	...	...	●≡	●*	*	...	●*	...	...	●≡	●*	*	●*	...	●	●≡	●	...	●	●*	...	...	●≡	●≡	●≡	●≡	●	●	●
Babbacombe	●	...	...	...	...	●▲ψ	...	...	●≡	...	*	●≡	●≡	*	●*	●*	●	●*	...	...	●	●*○	●*	...	●▲≡	●≡	●≡	●≡	●	●	●
Downside ..	●	...	...	...	...	●	...	...	ψ	...	●≡	≡	ψ	...	*≡	▲≡	●	...	...	...	●	●*	...	...	●*	●≡	●≡	●≡	●	●	●
Marlborough	●	...	...	...	...	●*	●*	...	...	...	▲≡	≡	≡	...	●≡	●≡	●	...	...	...	...	*≡	...	...	●≡	●≡	●≡	●≡	●	●	●
Strathfield T.	●	...	...	...	...	●*	≡	...	...	...	●≡	●≡	≡	≡	●*	●≡	≡	...	...	...	●*	●≡	...	...	●≡	●≡	●≡	●≡	●	●	●
Norwood....	●▲≡	≡	●≡	≡	●	●*	≡	...	≡	≡	*≡ψ	≡	≡	≡	*	●≡	○	...	...	≡	≡	●*	...	≡	●○	●≡	≡	●○	●	●	●
Eastbourne	●	ψ	●*	...	...	●	...	...	...	●*	...	*≡	...	●*	●	●	●▲	...	...	...	...	...	...	...	●*	●≡	●≡	●≡	●	●	●
Ramsgate ..	●	●▲	●	●	●	●*	●*	●*	●▲	●*	●▲	▲	▲	*	●*	●*	*	...	...	...	●*	*	...	...	●▲	●≡	●≡	●≡	●	●	●
Audley End	●≡	●*	*	*	●	●*	●≡	*	...	≡	●≡	≡	≡	≡	●*	●≡	...	*	...	...	●*	*	...	...	●	●≡	●≡	●≡	...	...	●
Hillington ..	●*	●ψ	●	●	●▲	●*	●*	●*	●	●*ψ	*	...	≡	●*	...	≡	●	●*	●*	≡	●*	*ψ	...	...	●*	●*	●	●≡	●	...	...
Lowestoft ..	●	●	●	●	●	●*	●≡	●*	●*	●▲	▲ψ	≡	●▲	●	...	≡	≡	●*	...	...	●*	...	...	...	●*	●*	●≡	●	...	...	...

EXPLANATION OF THE SYMBOLS.—● indicates rain; * snow; ▲ hail; ≡ fog; ⊼ thunderstorm; T thunder; ⊀ lightning; ○ solar halo; ψ lunar halo.

Abstract of Meteorological Observations for the YEAR 1878.

Station.	Mean of Pressures at 9 a.m. and 9 p.m.	Air Temperature.								Wet Bulb Therm.		Relative Humidity		Amount of Cloud.		Rainfall.			Weather, No. of days of					Wind, No. of Observations of								
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Total Fall.	Greatest Fall in 24 hours.		Rain, Snow or Hail.	Snow only.	Clear Sky.	Overcast.	Gales.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
					Min.	Max.	Min.	Date.	Max.	Date.								Amnt.	Date.														
	In.	°	°	°	°	°	°	Dec.	°		°	°	o/o	o/o			In.	In.														
Wakefield	29·902	48·5	47·3	47·9	41·8	55·2	10·8	25	86·8	June 27	45·8	45·1	81·3	84·3	7·0	6·2	27·88	1·10	April 20	181	20	21	118	3	52	51	56	44	53	76	182	76	140
Kelstern	·908	47·3	44·6	46·0	40·4	53·7	11·8	14	82·8	June 27	45·6	43·8	88·0	93·5	6·8	5·5	32·13	1·34	Nov. 15	212	35	40	120	8	73	61	63	67	67	137	107	129	26
Mansfield	·919	47·3	45·5	46·4	41·2	54·8	7·8	25	88·4	June 27	..	..	..	..	6·2	5·1	30·66	1·30	Aug. 23	187	26	56	90	0	74	32	44	32	49	131	129	51	188
Buxton	·929	46·3	44·1	45·2	..	51·7	2·5	24	80·4	June 26	44·1	42·7	83·9	87·9	7·2	6·9	53·62	1·44	Jan. 13	202	40	12	139	4	64	50	60	62	17	80	143	213	41
Cheadle	·917	46·2	45·5	45·9	40·9	..	16·9	14	82·0	June 27	44·3	44·1	86·8	89·1	7·1	6·0	37·57	1·21	Aug. 6	189	32	35	146	53	97	44	101	78	99	91	88	125	7
Llandudno	·903	51·1	49·0	50·1	45·2	47·1	20·7	13	93·0	June 27	47·8	46·5	78·4	82·5	6·9	6·0	29·66	1·57	Aug. 13	181	25	46	155	21	99	47	85	45	73	69	243	69	0
Shrewsbury	....	48·0	46·2	47·1	40·6	55·0	7·1	25	88·0	June 26	46·3	45·1	86·8	90·9	..	..	33·51	1·64	July 24	204	30	..	..	..	..	..	..	..	..	..	..	..	..
Churchstoke	·946	47·6	46·5	47·0	41·1	54·1	12·2	24, 25	83·3	June 26	45·4	44·6	84·0	85·5	6·6	6·2	34·18	1·18	Nov. 9	186	34	15	88	7	75	49	54	78	42	114	125	119	74
Hereford	·924	48·9	47·4	48·2	42·0	55·8	4·8	25	84·6	June 26	..	..	..	..	7·1	5·6	32·31	2·75	Sept. 7	191	17	33	126	3	41	50	41	20	40	60	93	61	324
Carmarthen	·926	51·0	47·7	49·3	43·2	57·4	11·6	12	85·4	July 21	48·7	46·6	84·8	91·7	6·9	6·0	46·00	1·95	Aug. 4	219	15	46	143	3	83	19	91	34	38	107	100	53	205
Dartmoor	·950	46·2	44·3	45·2	40·6	50·6	15·0	10	79·8	July 18	44·7	43·5	89·3	93·4	7·4	6·5	76·47	2·17	May 16	244	33	32	169	33	45	65	81	38	54	83	104	124	136
Babbacombe	·954	50·9	48·4	49·7	44·9	56·0	20·6	11, 15	78·3	July 18	48·3	46·8	82·9	88·0	6·9	6·1	36·08	1·20	Mar. 28	188	24	39	148	44	80	87	69	22	42	126	158	94	52
Marlborough ..	·950	48·7	46·8	47·8	42·0	56·3	14·0	25	84·8	June 26	46·5	45·6	85·7	90·5	7·4	6·1	35·83	1·16	July 1	175	24	38	165	0	39	29	53	8	38	119	98	29	317
Strathfield Turgiss	·944	50·3	47·2	48·8	41·4	57·4	8·2	25	89·1	June 26	47·7	45·8	82·4	89·4	7·0	6·1	24·69	·82	Nov. 10	152	14	42	149	3	37	31	59	54	49	181	106	102	111
Norwood	·938	49·8	48·2	49·0	43·1	56·5	13·0	25	86·6	June 26	46·9	46·1	81·0	85·3	7·0	5·8	28·27	1·70	April 10	177	23	43	138	18	69	51	82	16	63	97	154	75	123
Ramsgate	·946	50·6	48·7	49·6	44·7	55·5	19·1	25	82·7	June 26	47·9	46·9	82·6	87·3	7·0	5·9	30·40	1·25	Nov. 15	183	29	24	122	20	20	119	41	22	49	215	105	84	75
Andley End	·905	49·4	46·5	47·9	41·4	56·0	10·0	25	85·9	June 26	46·9	45·2	83·3	90·1	7·0	5·7	25·21	1·31	Nov. 14	192	41	31	131	1	28	67	16	67	28	152	66	197	109
Hillington	29·901	49·6	46·1	47·8	40·9	56·3	6·9	25	87·8	June 26	47·4	45·1	85·5	91·8	7·4	6·5	31·98	1·93	Aug. 3	187	31	23	156	11	53	83	55	78	54	175	88	128	16
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

APPENDIX.

OBSERVATIONS

FROM

STATIONS OF THE SECOND ORDER

FOR THE YEAR 1877.

HAWES.

Height above Mean Sea Level 800 feet. Long. 2° 11′ W. Lat. 54° 18′ N.

FEBRUARY, 1877.

Day.	Barometer.		Air Temperature.			Tension of Vapour.		Relative Humidity.		Wind. Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	29·805	29·949	44·1	47·5	35·2	47·5	·281	·311	97	96	WSW 1	SW 1	10	10	·260	Scotch ≋ all day.
2	·866	·837	48·4	38·1	38·0	49·8	·322	·172	95	74	SW 2	WSW 5	10	1	·640	Scotch ≋ all day. ⸝ *p.*
3	·918	29·875	37·4	38·2	33·8	43·5	·214	·200	88	88	SW 5	SW 5	10	10	·360	✳ *n.* ▲ showers till *gp.*
4	29·906	30·223	36·0	38·2	34·4	40·4	·192	·206	91	90	W 4	WSW 2	10	5	·120	✳ ☿ *n., a.* and during day. ▲ ☿ *p.*
5	30·068	30·161	43·2	44·0	38·0	45·0	·270	·272	96	94	WSW 5	NW 4	10	10	·180	
6	30·135	29·975	45·0	47·1	43·2	48·0	·295	·319	98	98	W 1	WSW 4	10	10	·500	Scotch ≋ all day.
7	29·986	30·112	46·0	40·2	40·0	48·4	·294	·218	91	88	W 5	WNW 3	10	1	—	
8	30·119	30·017	40·0	40·8	38·7	41·0	·207	·214	84	84	WSW 2	WSW 4	10	9	—	
9	29·988	29·764	40·0	43·0	39·1	45·7	·208	·285	85	96	W 4	WSW 3	10	10	·540	Scotch ≋ *p.*
10	·765	·861	46·0	38·0	37·3	47·0	·280	·229	91	100	W 5	E 2	10	10	·360	Scotch ≋ ☿ *p.*
11	·602	·806	43·8	41·7	37·5	46·8	·230	·236	80	90	W 4	W 5	3	0	·520	
12	·506	·561	45·2	42·8	38·1	47·0	·289	·240	97	88	SW 2	SW 4	10	10	·180	Scotch ≋ *a.*
13	·635	·827	42·2	40·8	39·4	44·0	·238	·231	89	92	W 4	SW 3	10	2	·640	Scotch ≋ *gs.* and during day. Scotch ⁘ ☿ *gp.*
14	·856	·854	46·9	46·9	39·9	48·3	·308	·304	97	95	W 1	SW 4	10	10	·090	
15	·778	·566	45·3	41·2	41·0	48·6	·259	·239	86	93	WSW 4	SW 4	10	1	·100	⁘ ☿ *a.* and *p.* Scotch ≋ *gp.*
16	·640	29·722	38·6	39·9	34·3	41·5	·208	·212	89	87	WSW 3	W 4	10	5	·080	
17	·920	30·029	40·0	41·1	38·0	45·3	·198	·236	80	92	NW 2	W 2	10	10	·090	
18	·971	29·920	43·2	39·0	38·0	47·0	·279	·214	100	90	WSW 2	WSW 2	10	8	·060	Scotch ≋ *a.* and *p.* Large ☋ ☿ *sp.*
19	·780	·824	36·8	34·5	32·6	41·2	·181	·187	83	94	W 2	S 3	3	10	·660	▲ ☿ showers during day. ✳ *gp.*
20	·357	29·583	33·2	36·0	32·1	40·0	·176	·167	94	79	NW 3	NNW 2	4	1	—	✳ ☿ *n.*
21	29·896	30·060	33·5	32·8	31·8	36·2	·157	·182	82	69	NNW 3	NNW 3	8	1	—	☾ ☿ *ga.* ☐ 11 *p.*
22	30·087	29·811	30·1	36·1	25·9	37·1	·121	·173	72	81	WNW 1	N 2	10	5	·120	✳ *p.* ☋ *gp.*
23	30·009	·866	37·5	38·0	34·7	42·8	·191	·218	85	96	N 2	W 2	10	8	·040	☐ *gp.*
24	29·554	·397	45·2	41·6	38·0	49·0	·260	·230	87	88	W 4	W 5	8	10	·380	✳ ☿ *n.* and *a.* Gusty during day.
25	·233	·253	42·0	36·1	36·0	43·0	·211	·180	80	85	W 5	WSW 3	9	10	·260	
26	·418	29·791	32·2	33·1	23·1	37·0	·131	·112	72	92	NNW 1	W 2	8	0	·180	Gusty with ✳ *n.* and *a.* ✳ ☿ *6p.*
27	29·852	30·044	24·0	19·5	18·8	27·6	·059	·042	46	44	WNW 1	WNW 2	5	0	·010	✳ (dry) *n.* ✳ *p.*
28	30·259	30·418	24·8	15·8	15·8	31·9	·051	·055	63	63	WNW 2	Calm 0	0	0	—	☐ *gp.*
Means	29·824	29·840	39·7	38·0	34·7	43·2	·218	·208	85·1	86·6	2·9	3·0	8·5	6·0	5·770	

STRATHFIELD TURGISS.

Height above Mean Sea Level 196 feet. Long. 1° 8′ W. Lat. 51° 20′ N.

FEBRUARY, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.				Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.		9 p.m.		9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%							ins.	
1	30·013	30·101	47·7	47·0	41·0	50·6	·289	·305	88	95	W	1	W	1	10	10	·003	
2	·098	29·974	48·9	43·9	42·7	50·7	·336	·225	98	78	SW	1	W	2	10	0	·053	
3	·266	30·086	39·0	46·0	33·0	50·9	·208	·275	88	90	W	1	W	1	2	8	·043	⌋ *a.*
4	·138	·370	40·4	33·9	33·8	47·1	·214	·182	86	93	NW	2	Calm	0	0	0	—	
5	·378	·306	39·9	47·0	32·1	48·5	·225	·298	92	93	S	1	S	1	9	10	—	
6	·311	·257	48·0	48·8	40·5	53·1	·309	·324	93	94	SW	1	SW	1	10	4	—	
7	·182	·191	52·9	50·1	47·1	57·6	·344	·308	86	85	W	1	S	1	8	10	·140	
8	·235	·199	43·5	40·7	39·0	50·8	·275	·234	97	92	N	1	SW	1	5	10	—	
9	30·129	·057	44·0	48·0	40·4	53·5	·265	·288	94	87	W	1	W	3	10	10	—	ϟ *p.*
10	29·930	30·009	50·8	48·0	47·0	51·7	·312	·293	84	88	W	2	W	2	10	9	·024	ϟ *a.*
11	·867	29·970	50·5	45·1	45·0	53·5	·304	·267	83	89	W	2	NW	1	1	0	·085	ϟ *a.*
12	·839	·789	47·5	45·8	43·3	53·4	·304	·263	94	86	SW	2	W	3	10	10	·088	ϟ nearly all day in squalls.
13	29·789	29·888	45·8	45·4	44·0	52·6	·262	·292	86	96	W	3	Calm	0	10	10	·197	
14	30·024	30·049	50·4	50·0	43·8	54·1	·277	·322	77	90	W	1	W	1	10	8	—	
15	29·983	29·774	47·7	47·9	46·3	50·6	·289	·287	88	87	SW	1	SW	2	10	8	·090	ϟ *p.*
16	29·845	29·918	41·3	40·0	37·4	49·4	·199	·196	77	79	W	2	N	1	0	0	—	
17	30·006	30·124	43·1	42·9	37·0	50·5	·219	·235	79	85	NW	1	N	1	10	9	—	
18	30·124	30·007	43·9	46·3	40·7	48·2	·245	·297	85	94	NW	1	W	2	9	10	·146	
19	29·944	29·598	41·3	41·5	38·7	47·7	·199	·214	77	83	NW	1	W	2	3	10	·311	
20	·223	·322	40·1	36·7	34·5	45·5	·195	·188	78	87	NW	4	N	2	10	5	·033	ϟ in squalls. ✱
21	29·814	·969	39·3	38·0	35·0	43·8	·172	·173	72	75	N	2	N	2	3	8	—	ϟ *a.* ⊐ *p.*
22	30·104	29·717	33·9	38·0	32·2	41·1	·167	·208	85	91	N	1	NW	2	3	9	·016	
23	29·941	30·001	37·0	37·4	35·6	43·8	·194	·204	89	91	NE	1	N	1	10	2	·084	
24	·758	29·618	44·8	46·1	36·2	50·6	·258	·268	87	86	NW	1	W	2	8	9	—	
25	·484	·444	48·8	46·4	43·8	51·9	·276	·241	80	78	W	2	W	3	10	3	·072	
26	·217	29·813	42·9	32·0	31·4	46·5	·204	·137	75	75	NW	3	N	1	5	0	·019	ϟ in squalls *a* ⌋ *p.*
27	29·840	30·053	37·9	29·4	29·0	41·0	·171	·100	75	63	NW	2	NW	1	7	0	—	ϟ in squalls. ⌋ *a.* ⊐ *p.*
28	30·125	30·381	31·7	27·7	25·0	38·4	·126	·120	70	81	N	2	N	1	0	0	—	⊐ *p.*
Means	29·954	29·971	43·7	42·5	38·6	49·2	·244	·241	84·4	86·1		1·6		1·5	6·9	6·1	1·404	

HAWES.

Height above Mean Sea Level 800 feet. Long. 2° 11′ W. Lat. 54° 18′ N.

March, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Relative Humidity.		Wind. Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	1889	°	in.	in.	%	%					ins.	
1	30·355	30·224	28·6	34·9	36·6		·055	·190	48	94	Calm 0	NW 1	8	10	·050	0 *gp.*
2	·096	·114	45·7	44·5	34·1	48·0	·290	·294	95	100	W 2	Calm 0	10	10	·300	Scotch *ga.*
3	30·037	30·021	45·7	41·9	41·6	47·0	·290	·266	95	100	W 1	Calm 0	10	10	·070	Scotch 0 during day.
4	29·945	29·947	38·0	34·9	30·9	44·1	·313	·172	93	84	Calm 0	WNW 1	10	0	·070	☿ *a.* ☌ 2 *ga.* ☿ *p.*
5	·941	·954	36·0	35·1	33·1	44·3	·176	·166	83	80	WNW 1	N 1	10	8	·100	☌ 3·30 *p.* and *gp.*
6	·977	·598	36·1	38·1	32·0	40·9	·170	·208	79	90	NNW 1	WSW 2	8	8	·240	
7	29·484	29·885	31·7	30·8	29·7	38·9	·169	·125	94	72	N 3	W 2	10	2	·210	☌ *a.*, 3 in. deep *ga.* ✣ during day.
8	30·053	30·148	26·7	31·0	24·7	34·8	·102	·107	71	62	NNW 2	W 2	1	5	·020	[≈ *gp.*
9	·128	·027	29·9	33·3	27·0	35·0	·152	·184	91	97	WNW 1	W 1	10	10	·130	☌ *8a.* ☌ (large, soft,) *ga.* ≈ 0 *gp.*
10	·007	·044	35·6	34·8	32·8	36·3	·193	·183	93	91	Calm 0	Calm 0	10	10	—	≈ 0 *p.* and *gp.*
11	30·155	30·032	35·0	38·3	33·0	38·3	·160	·218	78	94	SW 2	SW 2	10	10	·350	
12	29·573	29·547	40·2	38·0	36·3	45·0	·240	·182	96	79	W 4	W 5	10	1	·240	(*ga.* ▲ 0 during day. ☌ 0 *gp.*
13	·648	·778	42·0	45·2	35·3	46·2	·196	·268	74	90	WNW 3	W 3	10	10	·150	(*p.*
14	·737	·836	46·1	38·1	37·8	46·7	·225	·164	73	71	W 5	W 5	1	0	·060	(☌ 0 ▲ ⌒ during day. ☿ 5.30*p*
15	·776	·484	39·7	36·9	35·0	42·0	·204	·173	84	79	WSW 3	WSW 4	10	6	·190	✳ 0 *m.* ✳ ▲ 0 *ga.* and during day.
16	·588	·463	33·8	27·0	27·0	37·0	·154	·134	79	92	WNW 3	Calm 0	10	1	·060	
17	·500	·507	35·7	35·0	24·1	38·0	·159	·176	76	86	W 1	SW 3	9	5	·050	] *a.* ✳ 0 soft, *p.* [— *gp.*
18	·530	·624	40·5	32·5	32·2	41·4	·199	·171	79	94	WSW 2	Calm 0	9	3	·310	✳ U *a.* ✳ (soft,) ▲ *p.* ✳ (large)
19	·658	·613	36·0	28·0	20·8	43·3	·122	·120	57	78	Calm 0	Calm 0	0	0	—	*ga.* and *gp.* [*ap.*] *gp.*
20	·542	·599	30·7	28·9	20·7	43·4	·108	·110	64	70	SW 1	SW 1	10	7	—	] 2 *ga.*] *gp.*
21	·466	·572	33·9	29·9	24·2	40·4	·152	·122	78	73	Calm 0	Calm 0	9	5	—	] *ga.*] 0 *gp.*
22	·688	·800	34·1	29·0	27·2	42·8	·154	·134	77	84	Calm 0	Calm 0	7	0	·010	✳ U *n.*] *ga.* ✳ 0 *p.*
23	·689	·415	39·0	36·3	25·2	44·0	·165	·164	70	77	Calm 0	ESE 2	0	10	·020	☿ 0 Horn, *ga.* Ψ 0 *gp.*
24	·194	·111	35·6	34·9	32·9	37·9	·193	·185	93	91	ESE 3	E 2	10	10	·350	☿ *gp.*
25	·019	·229	36·9	39·0	34·0	41·1	·209	·231	96	98	ENE 5	ENE 4	10	10	·400	✳ 0 *n.* and *a.*
26	·277	·320	39·0	39·2	37·6	40·0	·227	·235	96	98	ENE 3	E 2	10	10	·320	Scotch 0 *p.*
27	·375	·371	40·2	40·7	37·1	48·6	·249	·245	100	96	E 1	E 1	10	10	·060	Scotch 2 *a.* and *p.*
28	·533	·831	45·0	34·0	34·0	49·4	·224	·173	75	88	W 2	Calm 0	8	0	—	[≈ 0 *gp.*
29	·898	29·904	36·0	39·0	27·2	46·7	·209	·218	99	92	Calm 0	E 1	10	10	·010	] 2 *a.* Scotch ≈ *ga.* ≈ 0 *p.* Scotch
30	·956	30·035	49·8	43·5	35·0	52·2	·194	·247	84	87	Calm 0	WSW 2	1	10	—	≈ 0 on Horn *ga.* ≈ 0 on hills, *gp.*
31	29·900	29·941	43·0	42·0	41·5	46·1	·259	·206	94	78	W 3	W 5	10	5	·050	Scotch ≈ *a.*
Means	30·133	29·735	37·6	36·0	30·9	42·5	·187	·186	81·6	86·0	2·6	1·7	8·1	6·3	3·880	

STRATHFIELD TURGISS.

Height above Mean Sea Level 196 feet. Long. 1° 8′ W. Lat. 51° 20′ N.

March, 1877.

Day.	Barometer.		Air Temperature.			Tension of Vapour.		Relative Humidity.		Wind. Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	30·408	30·345	39·4	38·6	22·2	45·1	·108	·212	69	91	NW 1	W 1	0	10	·100	
2	·242	·213	47·5	48·1	37·0	51·8	·316	·318	97	95	W 1	SW 1	10	10	·014	
3	30·161	30·067	48·0	45·5	44·7	52·6	·309	·293	93	97	SW 1	SW 1	10	10	·158	
4	29·869	29·923	46·2	40·4	40·4	47·1	·308	·242	99	97	S 1	N 1	10	10	·058	≡ *a.* ✳ *p.*
5	·956	·905	39·9	36·8	32·8	47·5	·202	·193	83	89	NW 2	N 1	0	6	—	
6	·935	·814	37·2	35·3	30·6	43·5	·184	·180	83	88	N 1	NW 1	10	3	·054	
7	·469	29·545	36·7	35·7	32·3	41·2	·167	·195	77	94	NW 2	N 3	2	10	·237	✳ *a.* and *p.*
8	29·950	30·101	34·9	30·5	29·0	40·6	·142	·128	71	75	N 2	N 1	4	0	·007	✳ *a.*
9	30·135	·122	35·1	34·0	28·5	40·8	·147	·175	71	89	N 1	Calm 0	6	10	·007	⌊ *a.* ✳ *p.*
10	·118	·124	34·5	31·6	31·0	38·1	·154	·133	78	75	NE 1	NE 1	10	10	—	
11	30·235	30·226	33·3	33·4	21·7	44·7	·107	·142	67	75	SE 1	SW 1	0	0	·015	⌊ *a.*
12	29·979	29·758	42·9	45·5	32·0	48·5	·254	·248	92	82	W 2	W 2	10	10	—	/ *p.*
13	·835	·939	47·3	50·2	42·3	52·6	·332	·296	72	82	NW 2	W 2	9	10	·024	/ *a.*
14	·954	·990	48·8	46·5	44·0	55·0	·272	·280	79	90	W 2	SW 1	9	10	—	
15	·979	·721	45·2	46·0	37·8	51·5	·220	·287	73	93	W 1	SW 2	8	10	·026	
16	·603	·571	40·8	34·8	34·3	48·1	·200	·162	79	80	SW 1	NW 1	7	0	—	
17	·612	·672	40·4	33·9	30·2	47·3	·182	·165	73	84	SW 1	NW 1	0	0	—	✳ *a.*
18	·682	·629	40·5	32·9	29·0	49·8	·188	·182	75	98	SW 1	W 1	0	2	·017	⌋ *a.* ≡ *p.*
19	·607	·509	37·0	37·4	24·2	47·2	·184	·185	84	83	Calm 0	N 1	0	4	—	⌋ *a.*
20	·396	·335	35·8	36·0	32·8	40·3	·158	·162	76	76	NE 1	NE 2	10	10	—	/ *a.* and *p.*
21	·363	·548	38·6	31·8	31·6	45·4	·174	·143	75	81	N 2	N 1	10	7	—	/ / *a.*
22	·699	·829	37·7	31·6	23·6	48·3	·124	·162	66	92	NW 1	Calm 0	2	0	·055	✳ *a.* ♈ during day.
23	·773	29·396	40·1	39·8	24·0	48·1	·191	·228	77	94	S 1	SE 2	8	10	·340	
24	29·296	28·991	44·0	43·9	35·0	51·5	·206	·266	71	93	W 2	SE 3	2	10	·270	/ *p.*
25	28·913	29·087	44·7	40·4	40·0	51·4	·244	·225	83	91	SE 1	SE 1	2	9	—	
26	29·156	·172	45·0	43·0	38·3	52·3	·262	·266	88	96	NE 1	Calm 0	10	10	·033	⊤ in afternoon. ≡ *p.*
27	·285	·501	48·0	39·9	33·6	51·2	·275	·333	83	95	Calm 0	NW 1	10	0	·313	⌋ *a.*
28	·707	·847	47·5	42·4	36·6	55·6	·265	·262	82	97	NW 1	SW 1	0	5	·284	Ψ ≡ *p.*
29	29·801	29·901	46·1	48·0	41·2	58·7	·307	·303	98	91	SE 1	SW 1	10	0	·034	⊤ *p.*
30	30·030	30·135	48·9	43·7	41·2	56·9	·273	·264	79	92	W 1	W 1	10	1	—	
31	30·149	30·095	49·9	46·7	37·2	53·4	·267	·265	76	84	W 2	W 2	2	10	—	≡ *a.*
Means	29·784	29·774	41·7	39·5	33·5	48·6	·214	·219	79·3	88·4	1·2	1·2	5·8	6·4	2·046	

HAWES.

Height above Mean Sea Level 800 feet. Long. 2° 11′ W. Lat. 54° 18′ N.

APRIL, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	29·975	29·974	40·1	37·0	28·0	46·2	·206	·179	83	81	W 3	Calm 0	10	0	·010	⁰ *a.* Scotch *p.*
2	·917	·650	43·0	46·6	23·0	50·1	·181	·311	65	98	WSW 1	WSW 3	1	10	·100	
3	·394	29·048	46·0	47·5	43·0	47·5	·294	·329	95	100	SW 2	SSE 2	10	10	·380	Scotch *p.*
4	·114	28·950	46·0	47·0	42·0	52·0	·287	·375	93	86	SW 2	SE 2	6	10	·510	⁰ on hills *ga.* ♈ ⁰ 6.15 *p.*
5	·216	29·381	44·0	39·4	36·2	50·2	·225	·217	77	91	S 2	SSE 2	9	4	·130	▲ *3p.* ♈ ⁰ 5.30*p.*
6	·460	·504	40·7	40·0	32·3	50·6	·235	·225	92	91	Calm 0	ESE 1	10	9	·200	⁰ *ga.* ♈ ⁰ 3.30 *p.*, 6.30*p.* and later.
7	·589	·632	46·1	38·7	32·1	53·0	·244	·218	79	93	Calm 0	Calm 0	8	4	·140	⁰ *ga.* ♈ ⁰ 4.30*p.* [Scotch ⁰ *9p.*
8	·679	·680	42·5	42·9	37·9	49·2	·250	·256	93	93	Calm 0	E 1	10	10	·090	⁰ *ga.* Scotch ⁰ in evening.
9	·652	·652	40·7	40·4	39·6	44·0	·238	·242	94	97	ENE 3	W 1	10	10	·380	Scotch *ga.—9p.*
10	·545	·582	42·5	42·3	39·0	49·6	·241	·338	89	89	Calm 0	W 1	10	10	—	
11	29·724	29·971	40·1	34·8	32·8	43·2	·193	·168	77	82	NNW 1	NNE 3	10	3	—	⁰ *9p.*
12	30·092	30·048	38·0	32·9	29·1	42·0	·156	·185	67	99	ESE 1	ESE 3	8	10	·470	soft, *9p.*
13	·006	·078	34·0	36·9	32·0	40·0	·193	·205	99	94	Calm 0	E 1	10	10	·040	soft, *n.* and *a.* 2½ ins. deep, *9a.*
14	·165	30·174	39·9	38·9	35·2	45·1	·216	·226	88	96	E 3	E 3	10	10	·020	[Scotch *p.*
15	30·090	29·933	40·3	38·8	37·5	43·8	·208	·197	84	84	ESE 3	ESE 3	10	10	—	
16	29·811	·903	39·9	35·9	35·0	42·3	·176	·157	71	75	ESE 5	E 5	10	10	—	
17	·921	·877	41·7	34·0	33·0	44·1	·159	·146	61	74	E 3	ENE 4	5	9	—	
18	29·829	29·946	37·0	35·5	33·8	39·4	·165	·164	75	79	E 2	ENE 3	10	10	—	Scotch ⁰ during day.
19	30·059	30·239	45·2	35·2	35·0	52·8	·194	·178	64	86	E 3	E 2	0	0	—	*9p.*
20	30·236	30·144	48·1	44·9	25·1	55·1	·220	·214	65	72	Calm 0	S 3	5	10	·140	⁰ *9p.*
21	29·949	29·700	38·2	45·7	36·9	45·7	·217	·390	94	95	SE 2	WSW 2	10	10	·370	⁰ during day. Scotch *p.*
22	·603	·573	51·0	40·3	40·0	54·0	·283	·250	76	100	Calm 0	E 2	10	10	·340	Scotch *p.*
23	·500	·613	42·2	35·7	34·8	44·3	·192	·195	73	94	WSW 1	E 1	8	5	·080	Scotch ⁰ *p.* ☋ *9p.*
24	·752	29·878	40·7	37·4	34·4	47·5	·200	·196	79	88	ENE 1	ESE 2	10	10	—	
25	29·969	30·034	42·2	37·5	32·3	47·0	·202	·195	76	87	E 1	E 2	5	10	—	
26	30·057	30·072	39·4	37·9	33·9	41·2	·195	·206	81	90	E 2	E 3	10	10	·010	Scotch ⁰ 10.30*a.*—*9p.*
27	30·035	29·932	38·3	35·7	34·7	46·0	·188	·182	82	87	E 4	E 4	10	10	—	⁰ *a.*
28	29·902	29·943	38·2	35·3	34·2	43·0	·192	·186	84	91	E 4	ENE 2	10	9	·020	⁰ *a.* and *p.* Scotch *p.*
29	29·969	30·102	40·1	38·8	34·0	46·1	·202	·203	81	86	ENE 1	E 2	10	10	—	▲ ⁰ during day.
30	30·195	30·354	40·8	34·9	34·2	45·1	·198	·132	69	75	NE 1	NE 2	10	10	—	
Means	29·813	29·819	41·6	39·0	34·4	46·6	·211	·211	80·2	88·4			8·2	8·4	3·430	

STRATHFIELD TURGISS.

eight above Mean Sea Level 196 feet. Long. 1° 8′ W. Lat. 51° 20′ N.

MARCH, 1877.

	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.		9 p.m.		9 a.m.	9 p.m.	
	in.	in.	°	°	°	°	in.	in.	%	%					in.	in.	
1	30·408	30·345	29·4	36·6	22·2	45·1	·108	·212	69	91	NW	1	W	1	·100	10	
2	·342	·213	47·5	48·1	37·0	51·8	·316	·318	97	95	W	1	SW	1	·014	10	
3	30·161	30·067	48·0	45·5	44·7	52·6	·309	·203	93	97	SW	1	SW	1	·158	10	
4	29·869	29·923	46·2	40·4	40·4	47·1	·308	·342	99	97	S	1	N	1	·058	10	
5	·956	·995	39·9	36·8	32·8	47·5	·202	·193	83	89	NW	2	N	1	—	6	
6	·935	·814	37·2	35·3	30·6	43·5	·184	·180	83	88	N	1	NW	1	·054	5	a. and p.
7	·469	29·545	36·7	35·7	32·3	41·1	·169	·195	77	94	NW	2	N	3	·237	10	a.
8	29·950	30·101	34·9	30·5	29·0	40·6	·142	·128	71	75	N	2	N	1	·007	0	
9	30·125	·122	35·1	34·0	28·5	40·8	·147	·175	71	89	N	1	Calm	0	·007	6	a.
10	·118	·124	34·5	31·6	31·0	38·1	·154	·133	78	75	NE	1	NE	1	—	10	p.
11	30·235	30·226	33·3	33·4	21·7	44·7	·107	·142	67	75	SE	1	SW	1	·015	0	
12	29·979	29·758	42·9	45·5	32·0	48·5	·254	·248	92	82	W	2	W	2	·024	10	a.
13	·835	·929	47·3	50·2	42·3	52·6	·232	·296	72	90	NW	2	W	2	—	10	
14	·954	·990	48·8	46·5	44·0	55·0	·272	·280	79	90	W	2	SW	1	·026	10	
15	·979	·721	45·2	46·0	37·8	51·5	·220	·287	73	93	W	1	SW	2	—	10	
16	·603	·571	40·8	34·8	34·3	48·1	·200	·162	79	80	SW	1	NW	1	—	0	
17	·612	·672	40·4	33·9	30·2	47·3	·182	·165	73	84	SW	1	NW	1	—	0	
18	·682	·629	40·5	32·9	29·0	49·8	·188	·182	75	98	SW	1	W	1	·017	2	a.
19	·607	·509	37·0	37·4	24·2	47·2	·184	·185	84	83	Calm	0	N	1	—	4	a.
20	·396	·335	35·8	36·0	32·8	40·3	·158	·162	76	76	NE	1	NE	3	—	10	a. and p.
21	·363	·548	38·6	31·8	31·6	45·4	·174	·143	75	81	N	2	N	1	—	7	a.
22	·699	·829	37·7	31·6	23·6	48·3	·124	·162	56	92	NW	1	Calm	0	·055	0	☈ during day.
23	·773	29·396	40·1	39·8	24·0	48·1	·191	·228	77	94	S	1	SE	2	·340	8	a.
24	29·296	28·991	44·0	43·9	35·0	51·5	·206	·266	71	93	W	2	SE	3	·270	10	p.
25	28·913	29·087	44·7	40·4	40·0	51·4	·244	·225	83	91	SE	1	SE	1	—	2	
26	29·156	·172	45·0	43·0	38·3	52·3	·262	·266	88	96	NE	1	Calm	0	·033	10	☿ in afternoon.
27	·285	·501	48·0	39·9	33·6	51·2	·275	·233	83	95	Calm	0	NW	1	·313	10	♒ p.
28	·707	·847	47·5	42·4	36·6	55·6	·265	·262	82	97	NW	1	SW	1	·284	0	♃
29	29·824	29·901	46·1	48·0	41·2	58·7	·307	·303	98	91	SE	1	SW	1	·034	5	☿ p.
30	30·020	30·125	48·9	43·7	41·2	56·9	·273	·264	79	92	W	1	W	1	—	0	
31	30·149	30·095	49·9	46·7	37·2	53·4	·269	·265	76	84	W	2	W	2	—	1	♒ a.
Means	29·784	29·774	41·7	39·5	33·5	48·6	·214	·219	79·3	88·4		1·2		1·2	·046	6·4	5·8

HAWES.

Height above Mean Sea Level 800 feet. Long. 2° 11′ W. Lat. 54° 18′

April, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.		Cloud Amount.			Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.		9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%						ins.	
1	29·975	29·974	40·1	37·0	28·0	46·2	·206	·179	83	81	W 2	Calm 0	10	0		·010	⁰ a. Scotch ⁰ p.
2	·917	·650	43·0	40·6	23·0	50·1	·181	·311	65	98	WSW 1	WSW 3	1	10		·100	
3	·394	29·048	46·0	47·5	43·0	47·5	·294	·329	95	100	SW 2	SSE 2	10	10		·380	Scotch ⁰ p.
4	·114	28·950	46·0	47·0	42·0	52·0	·287	·275	93	86	SW 2	SE 2	6	10		·510	⁰ on hills ga. ♈⁰ 6.15 p.
5	·216	29·381	44·0	39·4	36·2	50·2	·225	·217	77	91	S 2	SSE 2	9	4		·130	gp. ♈⁰ 5.30p.
6	·460	·504	40·7	40·0	32·3	50·6	·235	·225	92	91	Calm 0	ESE 1	10	9		·200	⁰ ga. ♈⁰ 3.30 p., 6.30p. and later.
7	·589	·622	46·1	38·7	32·1	53·0	·244	·218	79	93	Calm 0	Calm 0	8	4		·140	⁰ ga. ♈⁰ 4.30p. [Scotch ⁰ gp.
8	·679	·680	43·5	42·9	37·9	49·2	·250	·256	92	93	Calm 0	E 1	10	10		·090	⁰ ga. Scotch ⁰ in evening.
9	·652	·652	40·7	40·4	39·6	44·0	·238	·242	94	97	ENE 2	ENE 3	10	10		·380	Scotch ga.—9p.
10	·545	·582	42·5	42·3	39·0	49·6	·241	·238	89	89	Calm 0	W 1	10	10		—	
11	29·724	29·971	40·1	34·8	32·8	43·2	·193	·168	77	82	NNW 1	NNE 2	10	3		—	⁰ 9p.
12	30·092	30·048	38·0	32·9	29·1	42·0	·156	·185	67	99	ESE 1	ESE 2	8	10		·470	soft, 9p.
13	·006	·098	34·0	36·9	32·0	40·0	·193	·205	99	94	Calm 0	E 1	10	10		·040	soft, n. and a. 2½ ins. deep, ga.
14	·165	30·174	39·9	38·9	35·2	45·1	·216	·226	88	96	E 2	E 2	10	10		·020	[Scotch ⁰ p.
15	30·090	29·933	40·3	38·8	37·5	43·8	·208	·197	84	84	ESE 3	ESE 3	10	10		—	
16	29·811	·903	39·9	35·9	35·0	42·3	·176	·157	71	75	ESE 5	E 5	10	10		—	
17	·921	·877	41·7	34·0	33·0	44·1	·159	·146	61	74	E 3	ENE 4	5	9		—	
18	29·829	29·946	37·0	35·5	33·8	39·4	·165	·164	75	79	E 2	ENE 3	10	10		—	⁰ during day.
19	30·059	30·239	45·2	35·2	35·0	52·8	·194	·178	64	86	E 3	E 2	0	0		—	⁰ 9p.
20	30·236	30·144	48·1	44·9	25·1	55·1	·230	·214	65	72	Calm 0	S 2	5	10		·140	² a. ⁰ gp.
21	29·949	29·700	38·2	45·7	36·9	45·7	·217	·290	94	95	SE 2	WSW 2	10	10		·370	⁰ during day. Scotch ⁰ p.
22	·603	·573	51·0	40·3	40·0	54·0	·283	·250	76	100	Calm 0	E 2	10	10		·340	Scotch ⁰ p.
23	·500	·613	43·2	35·7	34·8	44·3	·192	·195	73	94	WSW 1	E 1	8	5		·080	Scotch ⁰ p. ♌ 9p.
24	·752	29·878	40·7	37·4	34·4	47·5	·200	·196	79	88	ENE 1	ESE 2	10	10		—	
25	29·969	30·034	42·2	37·5	32·3	47·0	·202	·195	76	87	E 1	E 2	5	10		—	
26	30·057	30·072	39·4	37·9	33·9	41·2	·195	·206	81	90	E 2	E 3	10	10		·010	Scotch ⁰ 10.30a.—9p.
27	30·095	29·932	38·3	35·7	34·7	46·0	·188	·182	82	87	E 4	E 4	10	10		—	⁰ a.
28	29·902	29·942	38·2	35·3	34·2	42·0	·192	·186	84	91	E 4	ENE 2	10	9		·020	⁰ a. and p. Scotch ⁰ p.

STRATHFIELD TURGISS.

Height above Mean Sea Level 196 feet. Long. 1° 3′ W. Lat. 51° 20′ N.

APRIL, 1877.

	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	in.	in.	°	°	°	°	in.	in.	%	%						in.
1	30·001	30·044	51·9	50·1	44·4	55·1	·274	·318	72	88	NW 2	W 1	10	10		·005
2	30·004	29·825	49·0	50·3	44·0	56·9	·269	·306	77	84	NW 1	SW 1	10	8		—
3	29·507	·191	50·7	51·7	44·0	55·3	·280	·346	77	90	SE 2	SE 1	10	10		·196
4	·172	·124	53·0	43·8	43·4	58·4	·313	·245	78	86	S 1	NW 1	8	3		·130
5	·278	·439	45·9	43·5	40·8	52·7	·265	·249	87	88	S 1	S 1	10	10	☿ a.	·357
6	·462	·517	48·4	42·3	37·5	54·6	·260	·248	77	92	S 1	SW 1	8	9	☿ p.	·313
7	·644	·650	49·3	43·5	36·2	52·8	·272	·264	77	94	SW 1	SW 1	10	1	(p.	·017
8	·675	·568	52·9	46·6	38·8	53·9	·308	·298	77	95	S 1	NE 1	10	10		·144
9	·531	·553	51·5	49·0	45·4	54·6	·321	·333	84	96	S 1	W 1	10	10		·406
10	·540	·599	52·5	48·1	44·6	60·2	·313	·287	79	86	NW 1	SW 1	10	0	T p.	·102
11	29·677	29·871	47·4	46·1	45·0	60·1	·303	·250	93	81	NW 1	N 1	10	5		—
12	30·038	30·034	44·1	42·8	36·8	51·6	·205	·236	70	86	Calm 0	E 1	6	10		—
13	29·997	·023	50·0	44·6	37·2	55·2	·253	·285	70	97	SE 1	W 1	10	7		·003
14	30·106	30·154	48·0	44·9	44·6	56·3	·298	·261	90	87	E 1	E 1	9	10		—
15	30·080	29·861	48·8	49·0	40·0	55·1	·235	·224	68	64	SE 2	SE 3	10	10		—
16	29·688	·647	44·9	40·3	39·7	49·9	·270	·136	91	54	SE 3	SE 3	10	0		—
17	·621	·581	43·5	36·4	35·3	46·1	·162	·195	58	91	NE 4	NE 2	5	5		·048
18	·615	29·755	42·4	39·2	34·3	43·1	·195	·188	76	79	NE 2	NE 2	10	10		·040
19	29·887	30·131	43·5	43·0	38·7	52·0	·201	·215	72	78	NE 2	NE 1	10	8		—
20	30·259	30·207	41·9	44·8	28·9	56·4	·225	·217	86	73	NE 1	Calm 0	6	10		·179
21	30·007	29·808	46·1	49·0	42·0	54·4	·295	·302	95	87	SE 1	S 1	10	5		—
22	29·665	·634	51·0	46·6	42·0	60·2	·322	·261	86	83	SW 1	SW 2	9	8		·057
23	·596	·585	45·9	36·0	36·0	56·1	·223	·192	73	91	SW 1	W 1	4	0		·039
24	·660	·804	47·8	45·3	30·8	59·0	·240	·240	73	80	NE 1	NE 1	5	5		·015
25	·906	·924	46·5	40·1	34·5	55·0	·350	·195	80	78	NE 2	NE 1	10	7	☽ p.	—
26	·946	·957	47·3	40·5	33·0	51·3	·332	·202	71	81	NE 2	NE 1	8	0		—
27	·885	·740	47·8	43·3	35·2	51·5	·218	·219	66	78	NE 2	NE 2	10	10		·528
28	·743	·824	43·0	42·8	40·0	49·3	·355	·236	92	86	NE 1	N 1	10	10	) all day.	—
29	29·837	29·933	43·8	46·1	39·0	51·3	·330	·261	80	84	NE 1	N 1	10	9		—
30	30·004	30·250	47·5	41·5	40·4	53·1	·241	·207	74	80	NE 2	NE 2	9	7	)	—
Means	29·772	29·773	47·5	44·4	39·1	54·1	·258	·247	78·3	83·9			8·6	6·9		·479

Squalls all day. ☽ p. ☿ a. ☿ p. ☽ p. ☽ all day. ☽ a. [Gale snapped vane-pole, etc

Squalls a. and p. ☽ p.

HAWES.

Height above Mean Sea Level 800 feet. Long. 2° 11′ W. Lat. 54° 18′ N.

MAY, 1877.

Day.	Barometer.		Air Temperature.			Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	30·440	30·433	36·9	33·0	31·0	43·6	·142	·160	66	86	N 1	Calm 0	10	10	—	☌ 0 a. and p. ☌ 0 gp.
2	·307	·206	42·1	38·7	32·0	53·0	·153	·168	58	72	Calm 0	SW 1	4	1	—	☌ 0 gp.
3	·228	·244	38·0	30·0	25·0	42·0	·163	·110	72	66	E 1	Calm 0	10	0	—	☌ 0 7a. ☍ 0 in day. ⌐ 2 Midt. ⌐ 2 10.45a.
4	30·180	30·016	39·0	36·0	21·5	48·4	·163	·188	70	89	Calm 0	Calm 0	8	5	—	
5	29·948	29·949	37·5	30·7	27·1	45·3	·147	·130	66	75	NNE 1	E 1	8	0	·010	☍ 0 9a. and p. ☌ 0 gp.
6	·857	·807	43·4	41·5	23·0	50·6	·144	·176	51	68	Calm 0	WSW 2	2	7	—	⌐ a. ≋ 0 up valley, gp.
7	·845	·857	45·5	40·0	30·9	53·0	·225	·190	75	77	Calm 0	W 1	10	10	—	
8	·796	·759	50·0	38·9	28·1	58·0	·261	·170	73	73	Calm 0	E 3	3	0	—	
9	·632	·615	45·5	42·8	35·1	52·2	·265	·255	88	93	ENE 2	ENE 3	10	10	·020	Scotch ≋ 9a. and during day.
10	·618	·620	44·9	42·0	41·2	45·1	·294	·265	99	99	ENE 2	ENE 3	10	10	·060	Scotch ≋ all day.
11	·645	·645	41·8	38·2	38·0	44·0	·231	·213	88	92	ENE 3	SW 2	10	10	·330	Scotch ≋ 9a. and during day.
12	·616	·690	43·0	43·9	38·1	48·7	·253	·283	91	99	E 1	E 1	10	10	·010	Scotch ≋ p.
13	·735	·737	45·2	44·8	41·9	54·2	·266	·283	87	96	NNE 1	E 1	10	10	—,	Scotch ≋ a. and p.
14	·696	·739	43·0	42·2	40·0	50·7	·259	·265	94	98	E 1	ESE 2	10	10	·080	Scotch ≋ all day.
15	·802	·947	41·3	45·0	40·3	49·1	·256	·273	99	91	E 2	WNW 2	10	1	·140	Scotch ≋ a.
16	·979	·965	51·8	47·0	43·0	57·7	·311	·294	80	92	SW 2	W 2	8	5	·020	☌ gp.
17	·780	·644	47·0	47·0	45·8	55·3	·321	·304	99	92	E 1	W 2	10	8	·370	Scotch ≋ a.
18	·773	29·794	47·9	45·3	44·2	51·1	·280	·272	85	90	W 4	WSW 3	10	10	·270	△ 0 a.
19	29·745	30·111	46·2	43·4	43·0	50·5	·266	·272	86	97	N 2	N 2	10	10	·670	Scotch ≋ during day.
20	30·237	·280	45·0	42·8	41·2	45·2	·233	·240	78	88	NNE 1	NNE 2	10	10	·020	Scotch ≋ a. and p.
21	·382	·416	44·0	40·0	39·7	49·1	·225	·213	77	86	NE 2	NE 2	10	10	—	
22	·394	·386	40·5	39·2	38·2	45·2	·200	·195	80	81	NE 2	NE 2	10	10	—	
23	·329	·332	43·0	38·4	35·1	50·1	·197	·204	71	88	NNE 1	NNE 1	10	0	—	☌ gp.
24	·200	·269	51·7	48·0	31·9	56·5	·245	·262	64	78	E 1	W 1	7	10	—	
25	·220	30·208	52·2	44·2	41·2	55·1	·246	·256	64	89	Calm 0	W 2	10	0	·190	△ 0 p. ≋ 0 gp.
26	30·130	29·987	53·0	47·0	34·1	56·3	·241	·258	60	80	W 1	W 2	4	10	·010	
27	29·688	·300	48·0	49·8	44·3	54·0	·288	·324	87	91	SW 2	SSW 4	10	10	·940	Scotch ≋ 0 a. and p.
28	28·948	·139	50·2	45·2	44·2	53·4	·284	·252	79	84	SW 4	W 6	10	8	·500	△ ♈ 0 10.45a.
29	29·326	·372	46·8	45·6	41·0	51·8	·240	·258	76	85	WSW 5	WSW 5	8	5	·040	△ w. and a. △ during day.
30	·455	·603	46·7	41·2	41·0	54·3	·298	·231	88	90	WSW 3	Calm 0	9	6	·020	
31	29·622	29·586	54·9	51·6	39·7	61·0	·305	·348	71	91	E 1	E 2	7	10	·440	
Means	29·690	29·692	45·4	42·0	36·8	51·1	·238	·236	78·1	86·3	1·5	1·9	8·6	7·0	3·340	

STRATHFIELD TURGISS.

Height above Mean Sea Level 196 feet. Long. 1° 3′ W. Lat. 51° 20′ N.

JUNE, 1877.

Day.	— Barometer reduced to 32° Fahr. 9 a.m.	9 p.m.	— Temperature 9 a.m.	9 p.m.	Min.	Max.	Vapour. 9 a.m.	9 p.m.	Humidity. 9 a.m.	9 p.m.	Wind and Force. 9 a.m.	9 p.m.	Amount. 9 a.m.	9 p.m.	Rain. 9 a.m.	Remarks.
	ins.	ins.	°	°	°	°	ins.	ins.	%	%					ins.	
1	29·375	29·783	54·7	51·4	50·4	60·0	·390	·312	78	85	S 4	SW 3	10	10	·090	☈ early a. ⟋ in squalls all day.
2	·853	·952	53·6	54·0	50·4	59·3	·364	·361	88	86	SW 2	SW 1	10	10	—	⟋ a. Squalls p.
3	·811	·726	68·7	61·5	44·2	76·1	·384	·436	55	81	S 2	SW 1	0	0	—	⟋ a.
4	·769	29·730	66·6	61·1	50·0	70·0	·436	·381	67	71	S 1	SW 2	5	8	—	≷ p.
5	29·925	30·088	60·5	51·8	51·8	65·9	·336	·312	64	81	W 3	SW 1	8	0	—	⟋ a.
6	30·043	29·961	55·6	49·5	42·7	61·6	·273	·303	62	87	S 2	W 1	10	0	·102	
7	·182	30·835	57·8	51·0	42·1	65·1	·315	·298	66	80	SW 1	Calm 0	5	10	—	
8	·142	·015	65·3	58·8	46·8	70·9	·343	·404	54	88	SW 1	SW 1	8	10	—	
9	·123	·141	63·8	56·7	49·0	71·0	·377	·373	64	81	W 1	SW 1	4	0	—	
10	·143	30·118	65·5	59·9	50·8	75·0	·366	·430	59	84	SW 1	SW 1	0	0	—	
11	30·124	29·904	69·8	68·1	47·0	81·5	·447	·485	62	70	W 1	SE 1	0	10	·065	Squally pp. ☈ p.
12	29·888	29·852	65·5	65·6	58·9	79·1	·514	·480	83	77	SE 1	SE 1	10	10	—	☂ before pd.
13	29·991	30·068	58·9	57·0	55·9	65·6	·444	·344	90	74	SE 1	E 1	10	10	—	≋ a.
14	30·102	·130	62·3	54·7	51·0	71·2	·394	·330	70	78	E 1	E 1	8	0	—	≋ a.
15	·168	·165	64·9	57·8	49·4	75·1	·418	·357	68	75	E 1	E 1	0	0	—	
16	·158	·107	69·0	61·0	44·6	77·8	·457	·334	61	62	E 2	SE 1	0	0	—	
17	·068	·035	68·2	62·7	48·6	79·1	·444	·384	64	68	E 2	SE 1	0	0	—	
18	·054	·107	72·1	68·3	49·0	85·4	·461	·409	58	73	SE 1	Calm 0	1	10	—	⟋ a.
19	·119	·106	73·0	69·7	49·2	82·0	·443	·477	54	82	SE 1	E 1	1	0	—	8 a.
20	30·092	30·012	70·3	64·8	54·2	79·4	·491	·489	66	81	S 1	Calm 0	8	7	—	
21	29·927	29·771	65·6	59·1	51·6	75·6	·391	·472	62	94	SE 1	E 1	3	10	1·088	☈ p.
22	·645	29·583	62·8	58·8	58·8	68·8	·413	·421	73	85	SW 1	SW 1	8	10	·012	
23	29·765	30·002	56·8	49·4	49·4	64·5	·306	·319	66	91	NW 1	Calm 0	10	5	—	
24	30·130	·175	57·4	53·5	41·9	65·0	·284	·284	60	78	NW 1	Calm 0	5	9	—	☂ about mid-day.
25	·187	·189	62·0	55·3	45·3	68·9	·324	·322	58	73	W 1	W 1	0	0	—	
26	·148	·118	64·0	58·8	48·1	69·2	·403	·391	67	79	W 2	W 1	10	4	·040	
27	·149	·133	61·3	54·4	54·0	70·3	·406	·356	75	84	NW 1	Calm 0	5	0	—	
28	·270	·235	64·5	60·2	44·6	77·4	·345	·382	57	73	W 1	SW 1	0	8	—	
29	·258	·248	68·0	60·7	50·7	81·0	·346	·393	50	74	SW 1	SW 1	0	0	—	
30	30·250	30·129	63·0	63·4	49·1	73·5	·457	·552	80	88	Calm 0	SW 1	10	0	·147	
Means	30·039	30·033	63·7	58·3	49·3	72·5	·390	·388	66·0	79·2	1·3	0·9	5·0	4·7	1·494	

HAWES.

Height above Mean Sea Level 800 feet. Long. 2° 11′ W. Lat. 51° 18′ N

JUNE, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	29·277	29·442	53·0	47·7	46·5	55·3	·304	·339	75	89	SSE 2	WSW 3	10	10	1·310	
2	·588	·682	55·4	52·9	45·7	57·0	·279	·339	64	82	WSW 5	WSW 4	5	10	·140	
3	·669	·601	53·0	55·2	50·0	72·0	·304	·349	75	81	SW 4	WSW 3	8	2	·010	
4	·733	·627	55·4	61·4	52·9	71·9	·382	·470	88	87	W 2	E 1	10	10	·130	
5	·639	·959	50·9	50·6	50·1	63·1	·327	·379	88	76	SW 3	WSW 4	10	10	·010	
6	·858	29·771	53·2	47·0	45·8	54·8	·335	·286	83	90	SSW 2	W 3	10	8	·370	
7	29·953	30·081	50·8	49·0	44·2	56·2	·278	·304	75	88	WSW 4	WSW 4	8	10	·040	
8	30·068	29·911	53·4	52·0	47·0	59·0	·288	·356	71	92	SW 3	Calm 0	10	10	·090	
	29·968	30·067	55·2	52·5	50·9	64·1	·346	·305	80	77	WSW 4	WSW 3	9	9	—	
10	29·996	·038	55·9	53·0	50·0	61·8	·331	·318	75	79	SW 2	W 4	10	3	—	
11	30·072	·074	55·3	51·0	48·1	63·4	·351	·330	80	88	W 2	Calm 0	8	10	·110	
12	·008	·030	51·9	48·0	46·9	53·0	·367	·330	95	99	Calm 0	ENE 1	10	10	·210	
13	·091	·148	50·8	48·8	48·0	62·6	·338	·324	91	94	SE 1	E 1	10	0	—	
14	·187	·333	56·9	47·5	38·6	65·8	·345	·285	75	88	E 1	E 2	4	0	—	
15	·261	·293	57·8	48·9	37·8	68·1	·346	·285	73	83	E 1	Calm 0	0	0	—	
16	·265	·339	62·1	49·1	36·8	70·8	·325	·298	58	86	ENE 1	E 2	0	0	—	
17	·191	·186	59·1	55·0	43·7	73·4	·325	·379	65	88	E 1	E 2	0	0	—	
18	·180	·188	65·0	56·2	43·6	75·0	·400	·386	65	86	E 1	E 2	0	0	—	
19	·183	·183	65·0	57·0	45·7	67·1	·409	·412	66	88	E 1	ESE 1	9	10	—	
20	30·089	30·077	68·4	54·5	52·3	77·7	·441	·386	63	91	Calm 0	Calm 0	10	6	·750	
21	29·983	29·809	59·7	55·0	47·0	72·1	·403	·339	79	76	E 1	ENE 2	10	6	·160	
22	·554	·445	53·0	54·0	47·3	57·0	·388	·391	100	94	Calm 0	WNW 1	10	10	·220	
23	29·756	29·987	47·9	46·8	44·8	56·3	·280	·279	85	88	N 2	W 1	10	7	·090	
24	30·104	30·156	52·1	47·0	36·5	59·0	·286	·258	73	80	Calm 0	W 1	8	10	·020	
25	30·081	30·007	51·1	52·9	46·1	56·0	·352	·375	93	94	W 2	WSW 2	10	10	·390	
26	29·876	29·984	56·1	53·0	52·8	62·0	·441	·351	98	87	WSW 3	WSW 1	10	2	·070	
27	30·112	30·191	56·9	50·3	44·8	60·0	·327	·330	71	91	WNW 1	W 2	8	8	—	
28	·193	·177	60·0	55·8	49·8	66·4	·374	·340	72	76	W 2	W 2	9	10	·070	
29	·110	·142	56·1	55·8	51·7	64·0	·428	·416	96	93	W 2	WSW 3	10	10	·100	

STRATHFIELD TURGISS.

Height above Mean Sea Level 196 feet. Long. 1° 3′ W. Lat. 51° 20′ N.

JUNE, 1877.

Day.	Barometer reduced to 32° and Mean Sea Level.			Temperature of the Air.			Vapour.	Humidity.	Wind and Force.		Amount of Cloud.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 a.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	%					ins.	
1	29·375	29·783	54·7	51·4	50·4	60·0	·330	83	S 4	SW 3	10	10	·090	↯ early a. ⟋ in squalls all day.
2	·853	·952	53·6	54·0	50·4	59·3	·364	88	SW 3	SW 1	10	10	—	⟋ a. Squalls p.
3	·811	·726	68·7	61·5	44·3	76·1	·384	55	S 2	SW 1	0	0	—	⟋ a.
4	·769	29·720	66·6	61·1	50·0	70·0	·436	67	S 1	SW 3	5	8	—	⟋ p.
5	29·925	30·088	60·5	51·8	51·8	65·9	·356	64	W 5	SW 1	8	0	—	⟋ a.
6	30·053	29·961	55·6	49·5	42·7	61·6	·273	87	S 3	W 1	10	0	·103	
7	·182	30·235	57·8	51·0	42·1	65·1	·315	66	SW 1	Calm 0	5	10	—	
8	·142	·015	65·3	58·8	46·8	70·9	·343	54	SW 1	SW 1	8	10	—	
9	·123	·141	63·8	56·7	49·0	71·0	·377	64	W 1	SW 1	4	0	—	
10	·142	30·112	65·5	59·9	50·8	75·0	·366	59	SW 1	SW 1	0	0	—	
11	30·124	29·994	69·8	68·1	47·0	81·5	·447	62	W 1	SE 1	0	10	·065	Squally pp. ↯ p.
12	29·882	29·853	65·5	65·6	58·9	79·1	·514	83	SE 1	SE 1	10	10	—	⊤ before pa.
13	29·991	30·068	58·9	57·0	55·9	65·6	·444	90	SE 1	E 1	10	10	—	≋ a.
14	30·102	·130	62·3	54·7	51·0	71·2	·394	70	E 1	E 1	8	0	—	≋ a.
15	·168	·165	64·9	57·8	49·4	75·1	·418	68	E 1	E 1	0	0	—	
16	·158	·107	69·0	61·0	44·6	77·8	·437	61	E 2	SE 1	0	0	—	
17	·068	·035	68·2	62·7	48·6	79·1	·444	64	E 3	SE 1	0	0	—	⟋ a.
18	·054	·107	72·1	62·3	49·0	85·4	·461	58	SE 1	Calm 0	1	10	—	⊗ a.
19	·119	·106	73·0	63·7	49·2	82·0	·443	54	SE 1	E 1	1	0	—	
20	30·092	30·012	70·3	64·8	54·2	79·4	·491	66	S 1	Calm 0	8	7	—	
21	29·927	29·771	65·6	59·1	51·6	75·6	·391	62	SE 1	E 1	5	10	1·038	↯ p.
22	·645	29·583	62·8	58·8	58·8	68·8	·413	73	SW 1	SW 1	8	10	·012	
23	29·765	30·002	56·8	49·4	49·4	64·5	·306	66	NW 1	Calm 0	10	5	—	
24	30·130	·175	57·4	53·5	41·9	65·0	·284	60	NW 1	Calm 0	5	9	—	⊤ about mid-day.
25	·187	·189	62·0	55·3	43·3	68·9	·324	73	W 1	W 1	0	0	—	
26	·148	·118	64·0	58·8	48·1	69·2	·403	67	W 2	W 1	10	4	·040	
27	·149	·233	61·3	54·4	54·0	70·3	·406	75	NW 1	Calm 0	5	0	—	
28	·270	·255	64·5	60·2	44·6	77·4	·345	57	W 1	SW 1	0	8	—	
29	·358	·248	68·0	60·7	50·7	81·0	·346	80	SW 1	SW 1	0	0	—	
30	30·250	30·129	63·0	65·4	49·1	73·5	·457	80	Calm 0	SW 1	10	0	·147	
Means	30·029	30·033	63·7	58·3	49·3	72·5	·390	66·0	1·3	0·9	5·0	4·7	1·494	

HAWES.

Height above Mean Sea Level 800 feet. Long. 2° 11′ W. Lat. 54° 18′ N.

JULY, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	30·039	29·982	59·7	51·0	46·0	63·9	·367	·345	72	92	Calm 0	WNW 2	9	0	—	☌ 9a. and 9p.
2	29·928	·917	53·8	50·4	49·5	58·1	·331	·329	79	90	WNW 1	WSW 3	10	4	·040	
3	·886	·905	56·7	47·2	46·5	58·3	·311	·296	67	92	WSW 2	WSW 3	5	8	·030	
4	·927	·971	54·9	47·0	43·1	59·9	·298	·289	69	90	W 2	W 2	8	1	·090	☌☌ 9p.
5	·897	29·885	53·1	48·0	37·9	60·2	·317	·268	78	80	Calm 0	WSW 1	8	5	·020	
6	29·867	30·039	52·1	46·3	35·0	59·0	·286	·284	73	91	Calm 0	W 1	7	9	·080	☌☌☌ 9p.
7	30·103	·188	51·1	47·0	41·8	61·0	·302	·275	80	86	NW 1	W 1	10	10	·020	☿ 11.15a. ☽ from noon.
8	·186	·295	52·8	50·9	38·1	58·7	·297	·311	74	84	Calm 0	W 2	10	10	·100	
9	·147	30·135	53·4	55·1	50·2	56·2	·369	·431	90	99	W 3	WSW 4	10	10	·330	
10	·091	29·984	55·9	56·7	55·1	62·1	·419	·439	94	95	WSW 3	WSW 4	10	10	·120	
11	30·017	30·049	53·3	51·1	50·6	59·1	·319	·336	78	89	W 2	W 2	10	9	—	☌☌ 9a. and 9p.
12	29·958	29·867	56·9	50·7	50·0	63·0	·340	·318	74	86	WSW 1	WSW 2	9	10	—	☌☌☌ 2 ≋≋ 9a. ☾ 9p.
13	·742	·630	55·8	57·0	43·2	64·0	·361	·434	81	93	Calm 0	SW 2	10	10	·050	
14	·516	·312	63·1	57·3	54·5	64·3	·441	·467	76	99	S 1	E 1	10	10	1·230	☿ 7a.
15	·638	·099	58·0	52·4	52·4	61·1	·482	·377	100	96	E 2	SE 2	10	10	·720	▲ 7a.
16	·336	·294	54·0	51·9	51·8	58·2	·388	·386	93	100	SE 2	WNW 1	10	10	·660	
17	·350	·590	55·4	54·7	50·4	58·4	·424	·384	96	90	Calm 0	W 2	10	10	·120	
18	·742	·864	55·3	48·2	48·2	59·0	·366	·319	84	96	W 2	W 2	9	0	—	☌☌ 2 9p.
19	·798	·684	60·1	55·0	39·9	66·8	·362	·409	70	94	Calm 0	WSW 2	10	10	·100	☌☌ 2 9a.
20	·803	·920	56·1	52·0	41·7	58·0	·368	·333	68	85	W 2	WSW 3	5	8	·020	
21	·867	·817	52·1	57·8	51·0	60·0	·381	·424	98	88	SW 3	SW 3	10	10	·090	
22	·677	·595	57·7	58·9	56·0	61·3	·428	·462	90	94	SSW 2	SSW 2	10	10	·300	
23	·482	·406	58·0	54·7	54·5	65·1	·479	·393	99	92	SSE 2	SW 2	10	10	·440	
24	·450	·611	56·0	53·0	50·0	62·8	·370	·348	83	86	WSW 1	WSW 3	5	3	·300	☾ 8.30a.
25	·768	29·863	55·0	54·3	50·6	60·3	·346	·361	80	85	WSW 2	WSW 3	10	10	·630	
26	29·859	30·017	60·7	54·4	51·8	66·0	·361	·361	68	85	WNW 1	WSW 2	3	3	—	
27	30·077	·112	55·7	52·2	51·0	60·0	·338	·351	76	90	WNW 2	WSW 3	10	10	·030	
28	·091	·098	53·1	59·8	50·8	60·1	·357	·459	88	90	W 2	W 2	10	10	·050	
29	·171	·192	59·2	60·0	57·9	61·2	·489	·480	98	93	W 3	W 3	10	10	·040	
30	·220	30·157	60·1	57·8	56·3	68·0	·444	·396	86	82	W 2	WNW 2	10	1	—	☌ 9p.
31	30·007	29·875	58·0	54·8	54·0	60·8	·461	·382	95	89	W 1	W 2	10	10	·010	≋≋ before 8a.
Means	29·836	29·847	56·0	53·1	48·7	61·1	·372	·369	85·2	90·4	1·1	2·2	9·0	7·8	4·930	

STRATHFIELD TURGISS.

Height above Mean Sea Level 196 feet. Long. 1° 3′ W. Lat. 51° 20′ N.

JULY, 1877.

Day.	Barometer.		Air Temperature.			Tension of Vapour.		Relative Humidity.		Wind, direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 p.m.	
	ins.	ins.	°	°	°	°	ins.	ins.	%	%					ins.	
1	30·048	30·049	57·7	56·6	50·2	66·5	·449	·416	94	90	SW 1	Calm 0	10	3	·123	
2	·022	·028	64·1	56·8	49·3	69·3	·381	·330	64	72	W 1	SW 1	10	0	—	
3	30·034	30·005	62·4	56·5	45·6	67·9	·365	·325	65	82	W 2	W 1	7	10	·047	☾ *a.* ♈ ☿ △ *p.*
4	29·991	29·988	56·5	55·3	52·2	69·8	·394	·340	61	78	W 1	SW 1	6	10	—	♈ before *ga.*
5	·981	29·898	59·0	48·7	43·7	68·7	·308	·331	61	96	W 1	W 1	5	3	·386	♈ *p.*
6	29·892	30·038	58·9	48·8	44·3	64·5	·308	·319	62	93	NW 1	NW 1	6	1	—	♈ *a.*
7	30·146	·206	56·6	48·6	42·0	66·5	·295	·309	65	91	NW 1	Calm 0	4	0	·040	♈ △ *a.* ♈ *p.*
8	·262	·296	58·8	54·2	39·3	64·2	·305	·358	61	85	W 1	Calm 0	8	10	—	
9	·330	·299	60·0	57·3	44·0	67·1	·416	·356	81	76	W 1	W 1	10	10	—	
10	·255	·161	64·4	61·7	51·8	75·4	·413	·454	68	83	W 1	W 1	5	10	—	
11	30·166	30·079	64·3	56·5	49·6	72·3	·434	·373	73	82	W 1	Calm 0	10	0	—	
12	29·926	29·876	64·0	59·5	45·0	74·2	·365	·389	61	77	W 1	SW 1	0	3	—	
13	·808	·768	65·1	60·3	45·4	71·8	·361	·415	58	79	W 1	SW 2	10	10	·042	
14	·575	·543	62·4	60·2	57·9	65·6	·482	·494	86	95	SW 1	SE 2	10	10	·720	
15	·344	·346	60·0	56·6	54·2	65·4	·433	·416	84	90	SW 2	SW 1	10	8	·313	
16	·340	·369	55·8	58·7	54·1	64·4	·415	·462	93	94	SW 1	SW 1	10	10	·140	
17	·505	·734	59·0	55·3	54·3	61·6	·404	·377	81	86	W 2	W 1	10	3	—	
18	·892	·892	60·1	57·0	49·5	66·4	·331	·419	64	90	W 2	Calm 0	2	10	—	
19	·869	29·824	62·5	62·5	54·1	69·2	·457	·467	82	83	W 1	W 1	10	10	—	
20	29·956	30·047	60·2	52·5	52·1	64·8	·302	·399	58	76	NW 2	SW 1	1	2	—	♪ *a.*
21	30·045	29·966	62·0	55·3	44·4	68·9	·348	·371	62	85	W 2	SW 1	6	10	—	
22	29·822	·768	64·2	59·0	51·1	67·8	·409	·454	68	92	SW 1	SW 1	10	8	·035	
23	·660	·522	64·3	58·8	58·4	64·7	·477	·464	80	94	S 1	S 1	10	10	·637	
24	·598	·727	63·7	57·5	50·6	67·7	·397	·399	68	84	W 1	W 1	4	2	—	
25	·913	29·986	61·7	58·2	51·0	68·5	·374	·399	69	82	W 2	SW 1	3	10	·116	
26	29·809	30·113	63·5	58·4	55·0	73·4	·475	·407	82	83	W 3	W 1	10	0	—	
27	30·154	·165	65·8	60·3	49·0	72·4	·449	·367	71	71	W 1	W 1	7	8	—	
28	·197	·179	59·9	63·0	47·6	66·7	·430	·507	84	89	W 1	W 1	10	0	·044	
29	·274	·301	71·5	63·4	57·1	79·1	·543	·485	70	84	W 1	W 1	0	0	—	
30	·315	30·217	64·2	65·0	51·0	82·1	·487	·543	81	88	W 1	W 1	5	3	—	
31	30·051	29·842	71·6	68·1	51·3	83·2	·586	·611	76	88	SW 2	SW 1	4	5	—	
Means	29·936	29·933	62·4	57·8	50·4	69·4	·406	·410	72·0	85·1		0·9	6·9	5·8	2·643	

HAWES.

Height above Mean Sea Level 800 feet. Long. 2° 11′ W. Lat. 54° 18′ N.

SEPTEMBER, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	30·001	30·018	51·1	44·0	38·3	54·3	·274	·274	73	95	W 1	Calm 0	3	10	·120	☽ early *a.* ♂ ² *pa.* ♂ *gp.*
2	29·933	29·928	53·0	46·3	39·7	60·2	·293	·297	73	95	Calm 0	E 1	9	10	·460	♂ *pa.* Cool gusts of wind.
3	29·968	30·177	45·3	44·2	43·1	50·0	·261	·263	87	91	NE 2	Calm 0	10	2	·020	
4	30·288	·351	51·8	42·3	36·0	58·5	·285	·259	74	96	Calm 0	Calm 0	1	1	·020	
5	30·242	30·087	54·0	51·4	38·1	58·3	·312	·335	74	88	W 2	SW 3	10	10	—	
6	29·921	29·937	54·0	45·2	45·0	57·7	·312	·292	74	97	W 3	E 1	10	10	·150	
7	29·961	30·062	48·9	39·5	39·2	56·5	·275	·231	80	96	ENE 2	Calm 0	10	0	—	☽ ² *gp.*
8	30·107	·164	49·2	46·1	35·3	49·5	·277	·288	79	93	ENE 2	E 2	5	0	—	☽ before *pa.* Cool and gusty *pa.* ♂ [*gp.*
9	·151	30·120	53·0	47·9	43·0	58·9	·304	·287	75	87	ESE 2	E 2	10	5	—	☽ *pa.* ♂ ⁰ *gp.*
10	30·075	29·992	54·0	52·0	40·2	57·2	·309	·340	74	87	ESE 3	E 1	7	10	·010	
11	29·810	·640	53·2	54·0	41·0	63·2	·385	·388	96	98	S 2	S 8	10	10	·360	☾ evening and night.
12	·640	·650	58·0	58·0	52·0	64·0	·348	·348	71	90	SSW 3	SW 8	9	10	·350	
13	·880	·640	58·0	56·0	50·0	59·0	·356	·400	78	90	SW 4	SW 4	10	10	1·700	
14	·710	29·878	57·0	51·0	51·0	58·0	·389	·345	73	92	WSW 6	Calm 0	10	10	·770	
15	29·908	30·206	55·3	48·2	48·2	57·7	·345	·315	79	94	NNW 2	SW 2	8	1	—	♂ ³ *gp.*
16	30·330	·344	50·4	46·0	43·5	58·0	·309	·311	85	100	WNW 2	Calm 0	4	1	—	♂ ² *pa.* and *gp.*
17	·427	·504	49·3	45·2	43·9	53·0	·279	·262	80	88	NNE 1	SE 1	10	1	—	♂ *pa.* ♁ *gp.*
18	·388	30·293	53·0	51·1	38·4	58·0	·306	·346	76	92	NW 1	Calm 0	4	3	—	♂ *pa.* and *gp.*
19	30·111	29·975	53·0	52·5	50·0	58·0	·356	·378	88	96	W 1	Calm 0	10	10	·010	≋ early *a.* ♂ ⁰ *pa.*
20	29·888	·879	47·0	41·2	40·9	52·5	·240	·227	75	89	NNE 2	NNW 2	3	5	—	≋ ⁰ *pa.* ♂ *gp.*
21	29·883	·994	46·0	41·9	38·0	50·3	·238	·250	77	87	NNE 3	NNW 2	1	1	·050	☾ *pa.* ◀ ⁰ in day.
22	30·003	29·921	47·6	46·1	36·0	54·0	·251	·268	76	86	WNW 1	WNW 2	6	2	·010	☽ before *pa.* ♂ *pa.*
23	29·939	30·024	47·4	44·1	44·1	54·1	·235	·268	73	93	N 2	Calm 0	3	10	·020	
24	30·110	·232	47·0	38·7	37·7	54·7	·233	·220	73	94	N 2	Calm 0	1	10	—	*gp.*
25	·190	·173	44·9	46·0	34·2	52·1	·205	·306	89	99	Calm 0	Calm 0	10	10	·020	☽ before *pa.* ♂ ² ≋ ⁰ *pa.* ≋ ⁰ in [day.
26	·307	·385	53·9	41·0	38·9	63·8	·306	·241	74	94	Calm 0	Calm 0	1	0	—	☽ ² *pa.* ♂ *gp.*
27	·415	·410	46·4	47·5	32·0	61·0	·281	·285	90	87	Calm 0	Calm 0	7	5	—	☽ ² ≋ *pa.* ♂ ♂ *gp.*
28	·374	·332	47·0	46·0	37·0	56·0	·298	·294	93	95	Calm 0	Calm 0	10	10	—	☽ ² ≋ *pa.* ≋ *gp.*
29	·307	·293	50·3	49·5	45·0	54·0	·330	·284	91	81	Calm 0	E 2	10	10	—	☽ ³ *pa.* ≋ *a.* ≋ ⁰ *p.*
30	30·206	30·260	49·0	47·0	43·8	58·5	·297	·316	86	98	E 1	Calm 0	10	10	—	≋ ⁰ *pa.* and before. ♂ *pa.* ≋ *gp.*
Means	30·068	30·095	50·8	46·8	41·8	56·6	·296	·297	79·6	92·1		1·0	7·1	6·0	4·070	

STRATHFIELD TURGISS.

Height above Mean Sea Level 196 feet. Long. 1° 3′ W. Lat. 51° 20′ N.

SEPTEMBER, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	30·128	30·086	57·4	46·4	39·6	64·4	·333	·277	68	89	NW 1	NW 1	0	2	—	9a.
2	30·024	29·863	58·3	48·9	41·6	65·4	·269	·321	55	93	NW 1	S 1	4	10	·280	9a.
3	29·691	30·093	52·0	46·0	44·8	60·5	·369	·364	95	86	SE 1	W 2	10	10	·720	
4	30·295	·362	52·7	48·7	42·2	62·4	·313	·323	79	94	NW 1	N 1	2	8	—	
5	·352	30·226	54·8	48·4	36·3	65·8	·303	·209	71	89	NW 1	W 1	0	2	—	
6	30·055	29·907	58·8	49·2	37·1	67·5	·410	·324	83	93	SW 1	W 1	0	0	—	
7	29·849	·895	59·0	52·6	45·0	65·9	·355	·312	71	78	SE 1	E 1	5	1	—	
8	·962	29·999	55·5	51·9	44·3	61·2	·296	·303	68	76	E 2	E 1	8	10	—	in day.
9	29·979	30·017	59·6	53·4	50·2	65·7	·365	·325	72	80	E 2	E 1	9	3	—	a.
10	30·031	29·990	56·7	54·0	47·1	66·8	·407	·388	88	93	E 1	SE 1	10	10	—	
11	29·816	·772	63·6	57·3	53·6	66·5	·464	·394	79	83	SW 2	W 1	8	0	·188	
12	29·871	·877	60·0	55·9	55·2	64·2	·396	·382	76	86	SW 1	SW 2	5	5	·064	p.
13	30·024	·973	60·5	60·0	51·6	62·2	·415	·424	79	82	SW 2	SW 2	10	10	·000	Squalls in day. p.
14	29·961	29·983	63·0	59·8	52·3	64·5	·489	·446	88	87	W 2	W 2	10	8	·050	
15	29·834	30·212	59·8	50·8	50·7	64·9	·410	·324	80	87	W 1	NW 1	10	0	—	
16	30·342	·398	50·1	52·4	42·0	65·4	·333	·328	92	83	N 1	NW 1	10	4	—	in afternoon.
17	·342	·363	51·4	52·1	42·1	62·2	·309	·352	82	90	NW 1	NW 1	10	9	—	9a.
18	·366	30·268	53·4	49·9	46·7	61·4	·323	·303	79	85	N 1	NW 1	10	9	—	p.
19	30·163	29·975	55·1	54·5	48·7	60·5	·378	·365	87	86	NW 1	NW 1	10	10	—	a.
20	29·852	·799	55·1	46·3	45·8	57·2	·377	·290	87	93	Calm 0	N 1	10	10	·040	p.
21	·828	·903	46·1	39·8	36·7	57·5	·244	·228	79	94	N 1	NE 1	2	0	—	
22	·975	·999	47·8	40·4	38·0	57·9	·261	·222	79	89	N 1	NW 1	0	0	—	
23	29·939	29·982	51·6	46·0	39·4	56·5	·292	·296	76	96	W 1	NW 1	9	8	—	
24	30·071	30·182	50·3	42·4	42·1	59·8	·304	·262	83	97	NE 1	NE 1	10	2	—	p.
25	·260	·214	44·5	48·9	30·7	57·7	·257	·313	88	91	N 1	SW 1	8	9	—	
26	·292	·358	53·7	42·9	41·0	64·2	·330	·263	82	95	SE 1	E 1	8	0	—	p.
27	·416	·383	43·5	50·5	39·1	62·0	·271	·349	96	96	Calm 0	NW 1	10	9	—	9a.
28	·376	·303	47·4	43·8	36·2	62·1	·309	·272	95	96	E 1	E 1	10	0	—	9a.
29	·254	·190	48·0	47·4	38·1	63·7	·328	·305	98	94	E 1	E 1	10	0	—	9a.
30	30·220	30·196	50·3	41·9	40·0	64·0	·346	·262	95	99	Calm 0	E 1	10	0	—	9a.
Means	30·086	30·089	54·0	49·4	43·3	62·7	·342	·317	81·7	89·3	1·1	1·1	7·3	5·0	1·348	

HAWES.

Height above Mean Sea Level 800 feet. Long. 2° 11′ W. Lat. 54° 18′ N.

SEPTEMBER, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	30·001	30·018	51·1	44·0	38·3	54·3	·274	·274	73	95	W 1	Calm 0	3	10	·120	
2	29·933	29·928	53·0	46·3	39·7	60·2	·293	·297	73	95	Calm 0	E 1	9	10	·460	
3	29·968	30·177	45·3	44·2	43·1	50·0	·261	·263	89	91	NE 2	Calm 0	10	8	·020	
4	30·288	·351	51·8	42·3	36·0	58·5	·285	·259	74	96	Calm 0	Calm 0	1	1	·020	☿ early a. ☌³ ☍ ☿ gp.
5	30·242	30·087	54·0	51·4	38·1	58·3	·312	·335	74	88	W 2	SW 3	10	10	—	☿ ☍ Cool gusts of wind.
6	29·921	29·937	54·0	45·2	45·0	57·7	·312	·292	74	97	W 3	E 1	10	10	·150	
7	29·961	30·063	48·9	39·5	39·2	56·5	·275	·231	80	96	ENE 2	Calm 0	10	0	—	☿ ☌³ gp.
8	30·107	·164	49·2	46·1	35·3	49·5	·277	·288	79	93	ENE 2	E 2	5	0	—	☿ before ☍ ☌ Cool and gusty ☍.
9	·151	30·120	53·0	47·9	43·0	58·9	·304	·287	75	87	ESE 2	E 3	10	5	—	☿ ☍ ☌⁰ gp.
10	30·075	29·992	54·0	52·0	40·2	57·2	·309	·340	74	87	ESE 3	E 1	7	10	·010	☿ ☍ [gp.
11	29·810	·610	53·2	54·0	51·0	63·2	·385	·388	96	93	S 2	S 8	10	10	·360	☿ ☍ ☌⁰ gp.
12	·610	·660	58·0	58·0	58·0	64·0	·448	·448	71	90	SW 8	SW 8	9	10	·350	☿ ☍ evening and night.
13	·680	·640	56·0	56·0	50·0	59·0	·396	·409	78	90	SW 4	SW 4	10	10	1·700	☿ ☍
14	·770	29·878	57·0	51·0	51·0	58·0	·389	·345	73	92	WSW 6	Calm 0	10	10	·770	☿ ☍
15	29·908	30·206	55·3	48·2	48·2	57·7	·345	·315	79	94	NW 2	SW 2	8	1	—	☿ ☌³ gp.
16	30·330	·344	50·4	46·0	43·5	58·0	·309	·311	85	100	WNW 2	Calm 0	4	1	—	☿ ☍ ☌² ☍ and gp.
17	·427	·504	49·3	45·2	43·9	53·0	·279	·262	80	88	NNE 1	SE 1	10	1	—	☿ ☍ ☍ gp.
18	·388	30·293	53·0	51·1	38·4	58·0	·306	·346	76	92	NW 1	Calm 0	4	3	—	☿ ☍ ☍ and gp.
19	30·111	29·975	53·0	52·5	50·0	58·0	·356	·378	88	96	W 1	Calm 0	10	10	·010	☿ ☍ early a. ☌⁰ ☍
20	29·888	·879	47·0	41·2	40·9	52·5	·240	·227	75	89	NNE 2	☌⁰ gp.	3	5	—	☿ ☍ ☍
21	29·883	·994	46·0	41·9	38·0	50·3	·238	·250	77	87	NNE 3	NNW 2	1	1	·050	☿ ☍ ☍ ▲⁰ in day.
22	30·003	29·921	47·6	46·1	36·0	54·0	·251	·268	76	86	WNW 2	WNW 2	6	2	·010	☿ ☍ before ☍. ☍.
23	29·939	30·004	47·4	44·1	44·1	54·1	·235	·268	73	93	N 2	Calm 0	3	10	·020	☿ ☍
24	30·110	·238	47·0	38·7	37·7	54·7	·233	·220	73	94	N 3	Calm 0	1	10	—	☿ ☍ gp.
25	·190	·173	44·9	46·0	34·2	52·1	·263	·306	89	99	Calm 0	Calm 0	10	10	·020	☿ ☍ before ☍. ☌² ☍ ☌⁰ ☍ in [day.
26	·307	·383	53·9	41·0	38·9	53·8	·306	·341	74	94	Calm 0	Calm 0	1	0	—	☿ ☍ ☌² gp.
27	·415	·410	46·4	47·5	32·0	61·0	·281	·283	90	87	Calm 0	Calm 0	7	5	—	☿ ☍ before ☍. ☌³ ☍ gp.
28	·374	·338	47·0	46·0	37·0	56·0	·298	·304	93	95	Calm 0	Calm 0	10	10	—	☿ ☍ ☌³ ☍ gp.
29	·307	·293	50·3	49·5	45·0	54·0	·330	·284	91	81	Calm 0	E 3	10	10	—	☿ ☍ ☌³ ☍ gp.
30	30·206	30·160	49·0	47·0	43·8	58·5	·297	·316	86	98	E 1	Calm 0	10	10	—	☿ ☍ ☌⁰ ☍ p.
Means	30·082	30·095	50·2	46·8	41·8	56·6	·296	·297	79·8	90·1	2·5	1·0	7·1	6·8	4·990	☿ ☍ ☌⁰ ☍ and before. ☌ ☍ ☍ gp.

STRATHFIELD TURGISS.

Height above Mean Sea Level 196 feet. Long. 1° 3′ W. Lat. 51° 20′ N.

SEPTEMBER, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Humidity.		Direction and Force of Wind.		Amount of Cloud.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	30·128	30·086	57·4	46·4	39·6	64·4	·323	·277	68	89	NW 1	NW 1	0	2	—	ga.
2	30·024	29·863	58·3	48·9	41·6	65·4	·369	·321	55	93	NW 1	S 1	4	10	·380	ga.
3	29·691	30·093	52·0	46·0	44·8	60·5	·369	·264	95	86	SE 1	W 2	10	10	·720	
4	30·295	·362	52·7	48·7	42·2	62·4	·313	·323	79	94	NW 1	N 1	2	8	—	
5	·352	30·226	54·8	48·4	36·3	65·8	·303	·299	71	89	NW 1	W 1	0	2	—	
6	30·055	29·907	58·8	49·2	37·1	67·5	·410	·324	83	93	SW 1	W 1	0	0	—	
7	29·849	·875	59·0	52·6	45·0	65·9	·355	·312	71	78	SE 1	E 1	5	1	—	
8	·962	29·999	55·5	51·9	44·3	61·2	·296	·293	68	76	E 2	E 1	8	10	—	in day.
9	29·979	30·017	59·6	53·4	50·2	65·7	·365	·325	72	80	E 2	E 1	9	3	—	a.
10	30·031	29·990	56·7	54·0	47·1	66·8	·407	·388	88	93	E 1	SE 1	10	10	—	
11	29·816	·772	63·6	57·3	53·6	66·5	·464	·394	79	83	SW 2	W 1	8	0	·188	
12	29·871	·877	60·0	55·9	55·2	64·2	·396	·382	76	86	SW 1	SW 2	5	5	·064	
13	30·024	·973	60·5	60·0	51·6	62·2	·415	·424	79	82	SW 2	SW 2	10	10	·000	p.
14	29·961	29·982	62·0	59·8	52·3	64·5	·487	·446	88	87	W 2	W 2	10	8	·050	Squalls in day. p.
15	29·834	30·212	59·8	50·8	50·7	64·9	·410	·324	80	87	W 1	NW 1	10	0	—	
16	30·342	·298	50·1	52·4	42·0	65·4	·333	·328	92	83	N 1	NW 1	10	4	—	
17	·342	·363	51·4	52·1	42·1	62·2	·309	·352	82	90	NW 1	NW 1	10	9	—	ga.
18	·366	30·268	53·4	49·9	46·7	61·4	·323	·303	79	85	N 1	NW 1	10	9	—	ga.
19	30·163	29·975	55·1	54·5	48·7	60·5	·378	·365	87	86	NW 1	NW 1	10	10	—	p.
20	29·852	·799	55·1	46·3	45·8	57·2	·377	·290	87	93	Calm 0	N 1	10	10	·040	a.
21	·828	·903	46·1	39·8	36·7	57·5	·244	·228	79	94	N 1	NE 1	2	0	—	p.
22	·975	·999	47·8	40·4	38·0	57·9	·261	·222	79	89	N 1	NW 1	0	0	—	
23	29·939	29·982	51·6	46·0	39·4	56·5	·293	·296	76	96	W 1	NW 1	9	8	—	
24	30·071	30·182	50·3	42·4	42·1	59·8	·304	·262	83	97	NE 1	NE 1	10	2	—	p.
25	·260	·214	44·5	48·9	30·7	57·7	·257	·313	88	91	N 1	SW 1	8	9	—	
26	·292	·358	53·7	42·9	41·0	64·2	·339	·263	82	95	SE 1	E 1	8	0	—	p.
27	·416	·383	43·5	50·5	39·1	62·0	·271	·349	96	96	Calm 0	NW 1	10	9	—	ga.
28	·376	·303	47·4	43·8	36·2	62·1	·309	·272	95	96	E 1	E 1	10	0	—	ga.
29	·254	·199	48·0	47·4	38·1	63·7	·328	·305	98	94	E 1	E 1	10	0	—	ga.
30	30·220	30·196	50·3	41·9	40·0	64·0	·346	·262	95	99	Calm 0	E 1	10	0	—	ga.
Means	30·086	30·089	54·0	49·4	43·3	62·7	·342	·317	81·7	89·3	1·1	1·1	7·3	5·0	1·348	

HAWES.

Height above Mean Sea Level 800 feet. Long. 2° 11′ W. Lat. 54° 18′ N.

NOVEMBER, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	30·309	30·328	47·3	45·5	44·3	51·0	·254	·248	82	78	W 2	WSW 2	3	10	—	Cold wind.
2	30·100	29·740	45·7	46·0	42·3	48·0	·248	·289	82	93	WSW 1	SW 4	10	10	·390	≋ gr. and during day. Gusty at gp.
3	29·955	30·006	43·2	43·1	39·8	47·5	·226	·238	81	85	WSW 2	SW 3	4	9	—	Cold air.
4	·812	29·478	44·5	45·8	41·8	47·0	·238	·271	81	88	SW 3	SSW 4	10	7	·280	Chilly.
5	·599	·590	46·3	48·2	43·2	49·2	·267	·312	86	93	WSW 3	SSW 4	10	10	·870	Rough *n.*
6	·490	·338	52·0	50·0	47·3	53·0	·333	·336	85	94	WSW 4	SW 1	10	10	·530	Rough *n.* Gusty *ga.*
7	·506	·651	46·3	43·5	41·7	52·5	·278	·247	90	87	WSW 3	Calm 0	10	2	·080	Cold day. ☾ *gp.*
8	·734	·675	43·1	46·4	38·5	48·2	·254	·266	91	85	WSW 2	S 2	3	10	·430	Scotch ≋⁰ *gn.*
9	·456	·278	47·2	45·0	43·8	52·0	·279	·268	87	90	WSW 1	SW 4	2	1	·070	[≺ in evening. ⁄ *gp.*
10	·115	29·127	44·7	44·9	42·3	47·1	·242	·257	82	87	SW 3	SW 5	10	10	·600	● and ▲ showers during day & evening.
11	29·050	28·499	44·9	45·3	41·9	49·8	·247	·281	83	93	S 4	SW 4	10	10	1·000	Rough day.
12	28·725	28·954	39·6	42·7	36·0	46·0	·196	·218	81	80	SW 3	SSW 3	10	10	·950	Cold day. Gusty *p.* ✳⁰ on hills, *gp.*
13	29·302	29·647	40·5	41·8	37·6	47·0	·237	·237	94	86	Calm 0	Calm 0	10	9	·020	☾☾ ≋² ≋⁰ *gn.* ≋≋ *p.*
14	30·061	·979	39·4	45·1	35·0	46·2	·225	·253	94	84	Calm 0	SSW 3	2	10	·340	☾☾ ≋² *gn.*
15	·161	29·996	48·0	51·0	44·5	53·0	·286	·348	86	93	W 2	SW 3	10	10	·290	⊃ *gp.*
16	·171	30·329	44·5	43·2	42·0	55·5	·338	·233	81	80	W 3	WSW 3	1	2	·020	⁄ in past night. Cold air during day.
17	30·356	30·146	41·3	42·0	40·0	47·0	·238	·233	92	88	W 1	SW 4	9	1	·080	
18	29·962	29·966	39·8	40·5	38·6	44·2	·218	·204	90	82	W 3	WSW 2	10	5	·140	
19	·765	·503	40·0	38·0	36·9	43·0	·207	·208	84	91	SSW 2	W 1	10	9	·460	
20	·495	·739	37·0	34·8	33·9	39·4	·181	·150	82	73	NW 2	NW 2	10	0	—	● ✳ *n.* and *a.* ✳⁰ on hills.
21	29·678	29·005	31·0	40·2	29·9	50·1	·149	·295	85	85	Calm 0	WSW 5	10	10	1·610	⌊⁰ ≋≋⁰ *ga.* Rough and blowy *gp.*
22	28·806	28·908	43·2	38·0	37·8	49·1	·338	·208	85	91	WSW 6	W 3	10	10	1·170	● ▲ ⁄ *n.* and *a.*, also during day.
23	29·358	29·613	41·5	37·1	36·5	44·5	·199	·199	77	90	WNW 3	W 2	3	5	·020	
24	·536	·507	30·2	34·4	28·3	43·0	·154	·165	92	83	Calm 0	E 2	0	7	—	⌊² ≋≋⁰ in valley *ga.* ⌊⁰ *gp.*
25	·763	·934	31·0	33·1	29·1	37·0	·142	·149	81	79	Calm 0	WNW 1	10	8	·040	⌊⁰ *ga.* ⌊ *gn.* Cold day.
26	·837	·390	35·3	40·0	31·9	40·0	·193	·222	94	90	Calm 0	ESE 2	10	10	·440	✳⁰ ● ⁰ *n.* ≋≋ on hills, *ga.* ≋≋⁰ *p.*
27	·190	·092	40·1	36·9	36·0	47·0	·219	·204	89	93	WSW 2	SW 2	10	10	·620	[▲ 1·45 *p.*
28	29·065	29·062	36·7	37·0	33·7	38·8	·185	·200	85	91	WSW 3	WSW 3	10	10	1·350	● *n. a.*, and during day. [☾⁰
29	28·675	28·858	37·7	36·0	35·2	42·5	·212	·205	94	97	W 1	WSW 2	10	10	·360	
30	28·919	28·885	36·0	39·0	35·2	40·0	·196	·219	93	93	SSE 1	WSW 2	10	10	·400	Scotch ≋≋ *ga.*—*gp.*
Means	29·362	29·307	41·3	41·2	38·2	46·6	·226	·238	86·2	87·2	2·0	2·6	7·9	7·8	11·560	

Rain by Observer, 11th November, 1·440 inch fell in half an hour, chiefly between 2 and 3 a.m.

Rain by Observer, 14th November, 1 inch fell in about half an hour, chiefly between 2 and 3 a.m.

Rain by Observer, 25th November, 1·440 inch fell in about half an hour, chiefly between 2 and 3 a.m.

Rain by Observer, 26th November, 1 inch fell in about half an hour, chiefly between 2 and 3 a.m.

Rain by Observer, 29th November, 1·350 inch fell in about half an hour, chiefly between 2 and 3 a.m.

Solar Halo observed on the 3rd November; it was visible sometimes to take the evening observations earlier than 9p.m.

STRATHFIELD TURGISS.

Height above Mean Sea Level 196 feet. Long. 1° 3′ W. Lat. 51° 20′ N.

OCTOBER, 1877.

Day.	Barometer.		Air Temperature.				Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%					ins.	
1	30·305	30·192	47·9	42·0	34·3	61·9	·308	·253	93	95	E 1	NE 1	5	9	—	≋ a.
2	·117	·026	45·4	39·0	32·0	63·2	·268	·233	89	98	Calm 0	NE 1	0	0	—	≋ a. and in afternoon.
3	·034	·075	44·8	37·5	30·2	62·5	·249	·230	84	99	Calm 0	Calm 0	0	0	—	≋ in afternoon.
4	·184	·313	49·0	41·3	28·0	62·3	·278	·240	80	93	Calm 0	Calm 0	3	0	—	≋ in afternoon.
5	·456	·563	49·9	43·5	29·8	63·7	·290	·267	82	94	S 1	SE 1	0	0	—	
6	·669	·633	46·5	42·8	29·6	61·7	·276	·257	89	94	E 1	NE 1	0	10	—	
7	·584	·347	44·0	51·0	33·7	57·8	·280	·317	98	85	Calm 0	N 1	10	10	—	≋ ga.
8	·216	·289	51·3	42·4	40·0	55·6	·316	·220	83	82	NW 3	NW 1	10	0	—	≋ during day.
9	·344	30·338	48·3	36·4	35·4	56·5	·240	·207	71	96	N 2	N 1	0	0	—	≋ a.
10	30·192	29·955	46·6	30·8	30·8	52·7	·253	·233	81	87	SW 1	SW 2	10	10	·134	
11	29·906	29·976	51·5	47·3	45·4	57·5	·244	·272	65	84	W 1	NW 2	0	4	—	
12	·967	30·047	52·1	46·6	42·2	56·7	·284	·257	73	82	W 1	Calm 0	2	10	·116	
13	·872	29·867	56·6	55·5	45·4	60·2	·425	·379	93	86	SW 3	SW 2	10	9	—	Squalls ga. ≋ in morning. ≋.
14	·817	·578	62·6	62·4	54·2	68·6	·397	·348	70	62	SW 1	S 2	0	0	—	≋ p.
15	29·731	29·906	52·2	45·6	42·9	66·2	·244	·213	63	75	SW 3	W 3	8	0	·030	≋ in squalls ga. and before. Heavy [rain p. Anemometer stage
16	30·092	30·369	48·0	37·1	35·6	51·1	·239	·201	72	91	W 2	NW 1	0	0	—	[destroyed.
17	·411	·410	43·8	36·4	29·5	53·9	·207	·207	72	96	W 1	NW 1	0	5	—	
18	·394	·335	41·6	30·3	24·3	55·4	·249	·160	96	96	Calm 0	Calm 0	0	0	—	≋ a. ≋ p.
19	·287	·239	40·9	46·2	26·0	57·4	·177	·245	70	79	Calm 0	Calm 0	10	10	—	ga. ⊍ p.
20	30·176	30·117	49·8	43·7	34·4	63·0	·264	·266	74	91	SW 1	SW 1	0	10	—	⊍ p.
21	29·944	29·775	53·0	55·4	40·8	56·9	·257	·370	64	85	S 1	SW 1	10	10	·070	
22	·833	·811	57·4	47·3	46·7	60·1	·377	·304	80	94	SW 2	W 1	10	1	·122	
23	·602	·491	47·5	42·8	36·8	56·4	·316	·257	97	94	Calm 0	W 1	10	3	·104	
24	·568	·484	45·2	48·6	35·0	55·8	·239	·319	80	94	SW 1	SW 1	0	0	·330	Squalls ga. ≋ T during day.
25	·390	·412	50·8	49·1	48·0	56·0	·364	·342	98	98	S 1	SW 1	10	10	·132	≋ ga. T.
26	·763	·978	47·2	41·0	40·0	59·1	·296	·246	92	96	SW 1	NW 1	0	5	—	⊍ p.
27	29·899	29·927	53·9	46·5	40·0	57·8	·344	·304	83	97	S 2	W 1	8	1	·240	
28	30·099	30·160	47·8	44·8	42·4	58·4	·298	·275	90	93	SW 1	SW 1	5	5	·073	≋ in squalls a.
29	29·835	29·630	53·4	54·5	41·3	58·2	·374	·360	91	85	S 2	SW 1	10	7	·348	≋ in squalls ap. and before.
30	29·874	29·676	51·5	57·4	46·0	59·9	·346	·371	91	79	SW 1	W 3	10	10	·017	≋ during day. ≋[2] at night.
31	30·162	30·315	52·3	48·0	46·1	59·0	·269	·264	69	79	W 2	W 1	0	4	—	≋ in squalls ga. and before.
Means	30·051	30·043	49·4	45·2	37·6	58·9	·289	·274	81·7	89·0	1·1	1·1	4·5	4·5	1·716	[during day.

HAWES.

Height above Mean Sea Level 800 feet. Long. 2° 11′ W. Lat. 54° 18′ N.

December, 1877.

	Barometer.		Air Temperature.			Tension of Vapour.		Relative Humidity.		Wind, Direction and Force.		Cloud Amount.		Rain.	Remarks.
	9 a.m.	9 p.m.	9 a.m.	9 p.m.	Min.	Max.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 p.m.	9 a.m.	9 a.m.	
	ins.	ins.	°	°	°	°	in.	in.	%	%				ins.	
1	29·189	29·621	35·8	39·0	34·7	40·3	·194	·218	93	92	Calm 0	W 1	8	·010	[on hills.
2	30·108	30·342	42·3	37·0	36·2	43·1	·244	·200	91	91	ESE 2	Calm 0	10	—	gr. ⁰ on hills.
3	·332	·250	41·4	40·8	37·0	43·8	·261	·241	100	96	ENE 1	E 1	10	·020	ga. and during day.
4	·118	30·044	37·9	39·5	36·5	41·8	·224	·238	98	98	Calm 0	Calm 0	10	·010	ga. and p. ⁰ on hills.
5	30·033	29·806	37·5	39·9	36·5	40·2	·218	·231	98	95	Calm 0	ENE 1	10	·200	ga. and before. gp. and be- [fore. ⁰ on hills.
6	29·352	·387	40·2	45·7	35·9	48·2	·238	·268	96	88	SSE 3	WSW 4	10	·900	Rough blowy day. ⁰ on hills.
7	29·759	29·826	39·0	38·0	36·3	45·7	·212	·190	90	83	WSW 2	WSW 3	8	·080	during day. ⁰ on hills.
8	30·029	30·117	41·0	43·0	33·1	44·1	·238	·257	93	93	WSW 2	WSW 3	10	·040	⁰ on hills. Gusty at gp.
9	30·119	29·986	38·9	42·0	38·2	43·0	·214	·225	91	85	WSW 1	Calm 0	10	—	all day. ⁰ on hills.
10	29·949	·977	40·2	36·2	36·0	42·9	·210	·189	85	89	Calm 0	Calm 0	10	—	all day. ⁰ on hills.
11	30·016	·648	39·5	40·6	34·1	42·0	·208	·222	86	88	WSW 2	SW 5	10	·750	a. Rough at gp. ⁰ on hills.
12	29·429	·755	40·2	36·5	34·7	49·0	·224	·183	90	85	W 4	W 3	10	·390	n. and a. during day. [gp. ⁰ on hills.
13	29·703	29·835	36·0	36·2	32·8	37·0	·174	·184	82	87	WSW 3	W 3	9	3	·160	n. and a. Gusty.
14	30·195	30·358	31·9	35·0	30·9	39·0	·159	·184	88	90	Calm 0	W 1	0	8	—	ga. gp. ⁰ on hills.
15	·367	·184	39·0	43·1	35·0	44·1	·210	·345	89	88	W 2	WNW 4	10	2	·270	⁰ on hills.
16	·172	·338	45·0	46·5	42·0	47·2	·275	·397	92	95	W 4	W 2	10	10	·050	Blowy, n. and a. ⁰ on hills.
17	·287	·323	43·0	42·9	42·0	47·1	·238	·222	86	81	W 4	W 3	10	0	·030	⁰ in day. ⁰ on hills.
18	·563	·552	38·3	36·9	35·8	44·3	·205	·204	89	93	SW 1	Calm 0	10	10	·010	ga. in valley, gp. T 9.30p. [Sharp peal. : earthquake.
19	·572	·672	41·9	37·8	36·0	43·2	·261	·194	99	86	WNW 1	WSW 1	10	6	—	ga. during day. p. gp.
20	·672	·493	39·6	42·2	36·8	42·4	·126	·235	78	88	Calm 0	W 2	8	10	·020	gr.
21	·459	30·347	45·3	45·8	41·7	47·0	·296	·389	98	94	W 1	WSW 5	10	10	·070	ga. and during day. gp. Gusty.
22	30·120	29·712	47·0	46·7	44·6	47·0	·305	·306	95	96	WSW 3	WSW 6	10	10	·280	during day. Gusty. [ing day. Gusty.
23	29·991	30·046	36·0	36·2	35·0	47·2	·149	·192	70	90	WNW 3	WSW 2	0	10	·490	Gusty. n. and a. dur-
24	·483	29·734	37·3	39·9	29·5	40·1	·188	·101	85	61	W 4	WNW 3	10	0	·060	⁰ evening and gp.
25	·742	·469	25·2	27·9	25·0	31·2	·093	·137	69	90	Calm 0	E 1	10	10	·170	n. + ga. 3 in. deep. + dur-
26	·198	·349	30·2	29·5	27·5	33·0	·149	·139	89	85	W 2	W 2	9	0	—	[ing day.
27	·488	·601	29·0	34·0	26·0	34·0	·082	·148	51	75	W 2	W 3	0	10	—	on ground.
28	·984	·768	26·3	33·2	25·8	35·0	·112	·154	81	82	Calm 0	Calm 0	10	10	·450	up valley, ga. during day. [⁰ evening.
29	·397	·540	44·9	44·3	33·0	46·5	·284	·257	95	88	WSW 5	SW 5	10	10	·270	Gusty all day. ⁰ on ground.
30	29·370	29·506	45·0	34·9	34·9	46·0	·275	·199	92	98	WSW 4	N 3	10	10	1·000	all day. ⁰ on hills.
31	30·054	30·293	35·3	35·4	33·7	41·2	·166	·193	80	93	WNW 1	Calm 0	0	10	—	gr. ⁰ on hills.
Means	29·950	29·964	38·1	38·6	34·4	42·5	·209	·211	89·7	88·2	1·8	2·1	8·2	7·6	5·740	

STRATHFIELD TURGISS.

Sea Level 196 feet. Long. 1° 3′ W. Lat. 51° 20′ N.

DECEMBER, 1877.

7	29·941	40·0	40·9	37·6	47·7	·207	·242	84	95	SW 1	SW 1	4	10	·044							
8	30·205	37·0	42·8	34·0	48·4	·195	·244	89	89	SW 1	SW 1	1	10	—							
9	30·232	·099	38·4	38·8	50·2	·208	·223	90	95	Calm 0	SE 1	3	4	—							
10	29·971	·027	34·0	33·8	32·3	39·3	·192	·179	98	92	Calm 0	SE 1	8	10	—						
11	30·094	30·003	35·1	43·3	28·3	43·5	·186	·333	91	83	SE 0·1	SW 2	10	10	·128	≡ 9a.	⌿ in squalls, p.				
12	29·768	29·977	48·5	37·0	36·8	51·3	·254	·200	75	91	W 2	NW 1	5	6	·188	Squally, a.	⊟ p.				
13	29·935	30·004	35·5	33·4	33·3	42·7	·197	·178	96	94	W 1	W 1	0	0	—						
14	30·230	·484	33·4	32·0	29·3	43·2	·166	·158	87	87	W 1	NW 1	4	0	—	] a.					
15	·532	·428	32·3	42·5	27·1	42·9	·145	·333	80	86	SW 0·1	SW 2	8	10	·035	] ⩒ a.					
16	·404	·375	42·0	46·8	41·6	48·6	·245	·277	92	87	W 1	NW 1	10	10	—	⩒ p.					
17	·431	·392	40·9	46·4	39·8	47·4	·236	·287	93	91	Calm 0	W 1	10	10	—						
18	·508	·590	35·3	31·0	30·4	47·0	·192	·174	93	100	Calm 0	Calm 0	0	10	—	≡ gp.					
19	·608	·655	31·4	39·7	28·8	47·3	·167	·236	95	96	Calm 0	Calm 0	10	10	·017	≡ all day.					
20	·694	·695	40·5	38·8	38·5	42·6	·245	·230	98	98	Calm 0	W 1	10	9	—	≡ all day.					
21	·524	·488	41·4	43·8	38·3	46·1	·245	·272	95	96	SW 1	Calm 0	10	10	·015	≡ a.					
22	·349	·660	45·5	47·9	42·8	48·9	·274	·294	91	89	W 1	SW 2	10	10	·043						
23	30·097	30·239	40·2	33·5	33·0	48·6	·208	·172	84	91	NW 1	NW 1	3	7	—						
24	29·853	29·847	41·3	32·0	31·8	47·1	·339	·158	90	87	W 2	NW 1	10	0	·046	] a.	∼ a.	✳ p.			
25	·827	·523	30·0	35·2	27·1	40·1	·161	·185	97	90	W 1	Calm 0	0	10	·084						
26	·374	·492	33·6	34·8	29·3	40·0	·158	·160	83	79	W 1	NW 2	0	3	—	✳ before 9a.	] a.	/ p.			
27	29·628	·833	33·3	34·0	29·6	38·1	·140	·149	74	76	W 2	NW 1	8	0	—	] a.					
28	30·061	·910	27·5	34·3	25·7	35·4	·110	·192	75	97	SW 1	SW 1	4	10	·477	≡ ✳ during day.	● gp.				
29	29·648	·750	50·0	45·9	34·0	53·5	·338	·275	94	91	SW 1	W 1	10	10	·054	✳ ● before 9a.					
30	29·800	29·471	49·0	49·3	44·7	51·1	·327	·316	94	90	S 1	S 2	10	10	·168	/ p.					
31	30·123	30·365	39·3	33·7	33·3	49·8	·188	·178	79	93	NW 2	NW 1	0	0	—	/ a.					
Means	30·058	30·073	38·9	39·3	34·3	46·0	·222	·223	90·1	91·3	0·8	1·0	6·7	6·7	1·677						

AUDLEY END, ESSEX.

Long. 0° 13′ E. Lat. 52° 1′ N. Height above Mean Sea Level, 162 feet till January 31st; 154 feet from February 1st.

1877.	Mean Pressure.	Air Temperature									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·851	41·1	40·6	40·9	35·4	47·4	25·8	23rd	56·0	19th	·247	·239	·243	92·7	92·2	92·5
February - -	·919	42·8	42·7	42·8	38·0	48·0	24·0	28th	56·2	7th	·254	·249	·252	89·6	88·8	89·2
March - -	·760	40·5	38·6	39·6	33·3	47·1	22·0	11th	56·0	25th	·212	·210	·211	82·4	87·6	85·0
April - -	·792	46·4	43·8	45·1	38·8	51·6	30·0	20th	62·4	4th	·249	·251	·250	78·6	86·9	82·8
May - -	29·893	50·3	45·9	48·1	39·9	56·4	22·0	5th	67·0	31st	·282	·270	·276	77·1	85·5	81·3
June - -	30·025	64·1	56·6	60·4	48·0	71·8	38·0	24th	81·8	18th	·390	·378	·384	65·3	81·8	73·6
July - -	29·909	62·4	57·7	60·1	51·4	69·3	45·2	7th, 8th	83·0	31st	·414	·420	·417	73·6	87·2	80·4
August - -	29·874	62·8	57·7	60·3	53·1	69·8	36·9	24th	80·2	20th	·438	·429	·434	76·6	89·2	82·9
September -	30·080	54·3	48·2	51·3	43·6	61·1	31·0	25th	70·0	11th	·351	·318	·335	83·5	93·2	88·4
October - -	30·035	48·6	46·2	47·4	38·9	57·1	26·0	18th	68·2	14th	·296	·292	·294	86·3	91·2	88·8
November -	29·685	43·5	43·2	43·4	36·6	51·2	27·3	4th	58·0	5th, 6th	·268	·267	·268	92·4	93·2	92·8
December -	30·053	39·0	39·8	39·4	34·5	44·9	25·0	26th	53·0	29th	·224	·229	·227	92·5	91·6	92·1
Year -	29·906	49·7	46·8	48·3	41·0	56·3	—	—	—	—	·302	·296	·299	82·6	89·0	85·8

AUDLEY END, ESSEX—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 1 foot above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gale.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	7·6	5·0	6·3	3·620	·470	10th	27	3	0	0	2	12	0	0	3	2	1	4	23	7	10	12
February - -	7·2	5·8	6·5	2·270	·330	22nd	18	6	1	0	2	11	0	1	0	0	0	0	14	10	29	2
March - -	6·7	5·3	6·0	2·160	·330	3rd	21	9	2	2	5	11	0	0	4	0	10	5	8	4	26	5
April - -	8·0	7·1	7·6	2·200	·410	9th	14	0	3	6	0	16	0	3	20	0	11	7	8	2	6	3
May - -	7·5	5·0	6·3	1·860	·410	12th	20	0	2	3	2	13	0	6	11	2	8	0	14	3	12	6
June - -	5·1	3·8	4·5	1·340	·850	30th	9	0	0	3	6	3	0	0	14	2	4	2	18	7	8	5
July - -	7·2	5·5	6·4	2·910	·550	14th	16	0	0	5	1	7	0	0	0	0	0	0	24	15	20	3
August - -	7·2	5·7	6·5	3·690	·770	25th	18	0	1	4	1	14	0	2	4	0	4	4	13	18	13	4
September -	6·4	3·5	5·0	1·130	·600	3rd	14	0	1	2	3	7	0	10	12	0	1	0	8	6	14	9
October - -	6·4	4·3	5·4	1·000	·190	29th	17	0	1	0	5	10	0	2	2	0	0	0	24	7	11	16
November -	6·0	3·2	4·6	3·160	·850	11th	23	0	1	1	7	7	0	0	2	0	2	6	25	8	8	9
December -	6·7	5·4	6·1	2·000	·620	28th	21	4	0	0	3	11	0	1	3	0	2	1	16	7	12	20
Year -	6·8	5·0	5·9	27·340	—	—	218	22	12	26	37	122	0	25	75	6	43	29	195	94	169	94

BABBACOMBE.

Long. 3° 31′ W. Lat. 50° 29′ N. Height above Mean Sea Level, 293 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·841	45·0	44·4	44·7	39·6	50·4	32·8	13th	55·7	27th	·277	·264	·271	91·4	89·4	90·4
February - -	30·032	46·5	44·3	45·4	41·3	51·5	28·0	28th	57·3	7th	·268	·263	·266	83·0	87·9	85·5
March - -	29·802	44·6	41·3	43·0	36·8	50·0	25·2	1st	61·1	30th	·234	·228	·231	78·3	86·2	82·3
April - -	·731	47·3	45·3	46·3	41·9	52·2	35·0	20th	64·1	21st	·281	·266	·274	85·8	87·4	86·6
May - -	29·883	50·4	47·7	49·1	43·5	56·1	36·3	3rd	63·6	31st	·282	·276	·279	76·2	83·0	79·6
June - -	30·022	60·0	56·0	58·0	52·3	65·9	44·6	25th	76·0	29th	·397	·376	·387	77·3	83·3	80·3
July - -	29·971	61·1	56·0	58·6	51·8	66·8	44·0	6th	77·9	29th	·409	·386	·398	76·3	85·4	80·9
August - -	29·899	61·6	57·0	59·3	54·3	66·5	41·6	24th	72·8	{17th 20th}	·436	·421	·429	79·8	89·5	84·7
September -	30·084	55·8	52·8	54·3	48·9	60·7	40·0	5th	67·8	19th	·358	·347	·353	80·1	85·9	83·0
October - -	30·051	52·8	49·3	51·1	44·8	58·3	31·3	17th	65·3	14th	·326	·308	·317	81·1	86·9	84·0
November -	29·699	47·4	45·5	46·5	41·3	53·7	34·6	17th	60·0	1st	·292	·280	·286	88·2	90·6	89·4
December -	30·097	42·2	41·9	42·1	38·1	48·1	30·9	25th	53·9	29th	·244	·244	·244	89·3	90·5	89·9
Year -	29·926	51·2	48·5	49·9	44·6	56·7	—	—	—	—	·317	·305	·311	82·2	87·2	84·7

BABBACOMBE—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 1 foot above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gale.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	7·7	6·6	7·2	7·890	1·050	2nd	29	2	2	1	0	11	5	1	2	1	3	9	23	16	3	4
February - -	6·6	6·6	6·6	1·610	·260	12th	18	3	4	0	2	14	3	6	2	0	0	1	15	21	10	1
March - -	6·1	5·2	5·7	2·670	·700	24th	22	5	8	1	5	8	1	8	5	1	4	5	11	17	9	2
April - -	9·0	6·4	7·7	5·800	1·940	15th	19	2	4	1	0	14	7	3	12	12	7	7	10	3	5	1
May - -	7·0	5·3	6·2	3·280	·720	16th	19	0	0	0	2	11	3	5	10	11	5	5	11	8	3	4
June - -	6·6	5·6	6·1	1·240	·360	21st	11	0	0	1	4	9	1	1	10	9	4	1	16	10	5	4
July - -	8·0	5·7	6·9	2·430	·800	14th	12	0	0	0	1	15	0	1	1	3	0	2	16	22	13	4
August - -	7·2	5·7	6·5	4·000	·870	7th	18	0	0	2	2	10	1	1	2	5	2	9	14	20	6	3
September -	6·5	5·1	5·8	2·430	1·140	2nd	8	0	0	0	5	12	3	9	13	9	1	2	8	4	9	5
October - -	6·5	4·2	5·4	2·460	·450	28th	16	0	1	0	5	6	2	5	6	3	2	4	19	16	2	5
November -	6·2	5·7	6·0	7·540	1·250	11th	25	1	4	1	1	7	4	1	1	1	0	5	28	18	3	3
December -	6·4	5·8	6·1	1·800	·460	5th	19	1	1	0	4	10	1	5	4	1	1	3	12	20	7	9
Year -	7·0	5·7	6·4	43·150	—	—	216	14	24	7	31	127	31	46	68	56	29	53	183	175	75	45

BUXTON.

Long. 1° 54′ W. Lat. 53° 14′ N. Height above Mean Sea Level, 987 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·789	38·1	38·4	38·3	33·1	43·8	21·0	12th	52·3	19th	·205	·204	·205	87·2	86·6	86·9
February - -	·884	39·8	39·1	39·5	35·9	43·8	20·0	28th	50·9	14th, 15th	·219	·209	·214	86·2	84·8	85·5
March - -	·756	38·1	36·6	37·4	31·5	43·5	19·0	21st	55·0	3rd	·194	·189	·192	83·1	85·3	84·2
April - -	·793	41·6	40·2	40·9	35·7	47·2	30·1	21st	53·1	22nd	·233	·224	·229	87·9	88·6	88·3
May - -	·882	45·7	42·5	44·1	37·4	51·4	22·0	6th	59·5	31st	·251	·238	·245	81·3	86·2	83·8
June - -	·995	57·3	53·6	55·5	46·6	63·9	40·0	7th	78·9	19th	·324	·331	·328	69·7	80·5	75·1
July - -	·872	56·1	53·2	54·7	48·9	61·3	39·9	5th	71·7	30th	·359	·355	·357	79·5	86·4	83·0
August - -	29·839	56·4	54·3	55·4	49·7	62·5	42·2	23rd	70·1	5th	·383	·379	·381	84·2	88·9	86·6
September -	30·079	50·9	47·5	49·2	42·7	57·0	33·5	25th	64·1	16th	·307	·289	·298	82·3	87·0	84·7
October -	29·970	46·3	43·6	45·0	38·8	*	29·0	18th	62·9	14th	·280	·254	·267	88·7	88·2	88·5
November -	29·595	41·7	41·5	41·6	37·0	*	27·7	24th	*	—	·235	·239	·237	87·9	89·6	88·8
December -	30·008	38·4	37·8	38·1	34·0	*	23·2	26th	*	—	·210	·205	·208	89·3	89·1	89·2
Year -	29·872	45·9	44·0	45·0	39·3	—	—	—	—	—	·267	·260	·264	83·9	86·8	85·4

* Maximum thermometer out of order.

BUXTON—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 1 foot above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear sky.	Overcast.	Gale.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	8·0	8·8	8·4	7·823	1·520	29th	24	10	0	1	0	20	2	0	3	4	3	2	18	15	13	4
February - -	8·5	8·7	8·6	7·855	1·430	25th	24	7	0	1	1	21	2	7	1	0	0	0	1	25	20	2
March - -	7·9	8·0	8·0	3·560	·600	24th	18	6	0	0	0	18	2	7	5	4	2	1	8	12	16	7
April - -	8·8	9·0	8·9	2·385	·480	22nd	16	2	2	2	0	22	3	0	4	14	17	5	8	4	5	3
May - -	8·1	7·4	7·8	4·845	·930	18th	15	0	1	2	0	15	0	3	8	19	6	5	4	8	7	2
June - -	6·4	7·1	6·8	3·840	1·000	1st	13	0	0	1	3	13	0	1	0	10	11	0	8	20	9	1
July - -	8·5	8·4	8·5	5·735	1·970	14th	23	0	0	0	0	19	0	3	0	0	0	2	8	17	29	3
August - -	8·0	7·9	8·0	6·155	1·050	8th	23	0	0	2	0	16	0	3	2	6	6	3	11	6	21	4
September -	6·9	6·1	6·5	3·170	1·040	2nd, 14th	13	0	0	0	0	11	0	5	6	9	5	2	7	6	19	1
October - -	7·5	6·8	7·2	6·295	·900	11th	20	1	1	0	1	11	1	4	3	0	4	1	17	21	10	2
November -	7·3	7·4	7·4	8·235	·970	30th	24	3	2	1	0	12	0	2	0	1	0	2	13	26	16	0
December -	8·0	7·5	7·8	5·060	·900	30th	24	9	0	0	0	13	1	1	2	4	1	1	5	20	26	2
Year -	7·8	7·8	7·8	64·958	—	—	237	38	6	10	5	191	11	36	34	71	55	24	108	180	191	31

CARMARTHEN.

Long. 4° 18′ W. Lat. 51° 52′ N. Height above Mean Sea Level, 188 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·781	43·6	43·4	43·5	38·8	50·4	30·8	12th	54·5	27th	·266	·269	·268	92·5	94·2	93·4
February - -	·970	45·7	43·5	44·6	40·1	50·4	30·0	28th	55·9	15th	·287	·272	·280	91·8	94·3	93·1
March - -	·769	43·9	41·1	42·5	35·7	49·6	24·4	1st	57·3	13th	·244	·240	·242	84·2	91·5	87·9
April - -	·717	47·8	44·3	46·1	40·5	54·1	31·7	20th	61·4	{10th 14th}	·278	·263	·271	83·4	89·8	86·6
May - -	·855	52·4	47·0	49·7	42·0	57·5	29·5	5th	64·2	25th	·304	·284	·294	76·9	87·6	82·3
June - -	·982	61·5	56·9	59·2	52·2	67·5	43·2	25th	79·8	18th	·433	·422	·428	79·6	90·6	85·1
July - -	·912	59·9	55·9	57·9	52·0	65·3	39·8	6th	72·6	28th	·449	·430	·440	87·1	95·4	91·3
August - -	29·842	60·7	56·7	58·7	52·6	66·7	40·1	24th	72·8	5th	·460	·432	·446	86·4	93·2	89·8
September -	30·071	55·6	50·7	53·2	44·8	62·5	36·2	23rd	66·8	10th	·375	·348	·362	84·6	92·7	88·7
October - -	29·990	51·1	48·7	49·9	42·9	59·2	28·9	18th	67·7	15th	·337	·325	·331	88·5	93·1	90·8
November -	29·612	46·4	45·8	46·1	39·6	53·2	29·9	14th	59·2	5th	·291	·297	·294	91·1	94·5	92·8
December -	30·050	42·5	41·7	42·1	37·5	48·4	29·3	28th	53·2	29th	·254	·253	·254	92·3	94·3	93·3
Year -	29·879	50·9	48·0	49·5	43·2	57·1	—	—	—	—	·332	·320	·326	86·5	92·6	89·6

CARMARTHEN—*Continued.*

Thermometers 1 foot above ground. Rain-gauge 1 foot above ground.

1877	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear sky.	Overcast.	Gales.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	7·9	7·1	7·5	8·940	1·450	3rd	28	0	3	1	0	14	0	5	1	5	3	6	16	9	3	14
February - -	7·8	7·1	7·5	4·250	·480	1st	24	2	3	0	1	15	0	10	0	0	0	1	17	13	9	6
March - -	6·3	5·6	6·0	3·890	·790	24th	26	3	4	1	3	10	0	11	2	4	5	2	10	9	6	13
April - -	7·8	5·9	6·9	3·510	·680	15th	17	0	2	0	2	15	1	4	3	17	11	4	3	8	0	10
May - -	6·5	5·1	5·8	4·430	1·770	27th	16	0	0	1	5	11	0	4	7	14	5	8	7	7	2	8
June - -	6·4	6·7	6·6	2·910	·840	1st	18	0	0	1	6	14	0	5	6	10	1	10	14	7	1	6
July - -	8·3	7·1	7·7	4·920	1·320	22nd	17	0	0	0	0	16	0	1	0	0	0	·2	20	15	9	15
August - -	7·4	6·4	6·9	7·800	1·230	7th	21	0	0	1	1	14	0	2	0	9	5	4	13	12	7	10
September -	6·0	3·9	5·0	3·380	·800	2nd	12	0	0	0	7	7	0	8	1	11	4	0	5	4	2	25
October - -	6·4	5·4	5·9	6·470	1·350	28th	20	0	2	1	5	9	0	3	0	4	1	5	12	10	1	26
November -	6·5	6·8	6·7	8·630	·870	11th	26	3	4	1	0	8	0	1	0	2	0	3	23	11	3	17
December -	6·5	6·5	6·5	4·130	1·020	28th	22	1	0	0	3	12	0	6	0	4	2	0	12	12	6	20
Year -	7·0	6·1	6·6	63·260	—	—	247	9	18	7	33	145	1	60	20	80	37	45	152	117	49	170

CHEADLE, STAFFORD.

Long. 1° 57′ W. Lat. 52° 58′ N. Height above Mean Sea Level, 646 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·778	38·8	39·8	39·3	34·8	44·8	29·0	12th	52·7	19th	·216	·217	·217	92	89	91
February - -	·893	39·8	40·4	40·1	35·4	45·7	22·3	28th	52·2	14th	·217	·224	·220	89	89	89
March - -	·745	37·9	38·0	38·0	32·5	44·7	22·0	1st	53·9	30th	·199	·203	·201	87	89	88
April - -	·782	42·3	41·1	41·7	37·1	48·5	31·1	20th	55·1	22nd	·222	·224	·223	82	87	84
May - -	29·881	46·3	44·4	45·3	38·8	53·0	28·3	4th	61·0	31st	·240	·238	·239	76	81	79
June - -	30·004	56·8	55·9	56·4	47·9	65·1	39·0	24th	76·6	18th	·346	·342	·344	75	77	76
July - -	29·880	56·8	55·1	55·9	49·7	62·8	42·2	8th	74·1	30th	·381	·377	·379	82	87	84
August - -	29·848	56·8	54·8	55·8	50·2	63·7	42·0	24th	73·2	20th	·394	·394	·394	85	92	89
September -	30·083	50·7	48·9	49·8	44·2	57·4	33·8	21st	61·6	28th	·306	·308	·307	83	89	86
October - -	29·980	46·8	45·7	46·3	40·8	53·6	31·9	18th	64·9	14th	·284	·268	·276	88	87	87
November -	29·605	41·1	42·3	41·7	36·6	48·0	29·4	25th	55·1	15th	·238	·246	·242	92	91	92
December -	30·015	37·8	38·1	37·9	34·4	42·9	24·8	26th	49·5	6th	·213	·212	·213	94	92	93
Year -	29·875	46·0	45·4	45·7	40·2	52·5	—	—	—	—	·271	·271	·271	85·4	87·5	86·5

CHEADLE, STAFFORD—*Continued.*

Thermometers 4 feet above ground. Rain gauge 1 foot above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gale.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	8·1	8·1	8·1	5·010	1·200	3rd	25	7	2	0	1	20	3	3	9	0	6	12	14	3	8	7
February - -	6·0	6·3	6·2	3·660	·480	{19th 22nd}	23	5	2	0	3	9	4	6	1	0	0	5	22	8	14	0
March - -	6·5	5·8	6·1	3·220	·790	24th	24	5	2	1	4	10	5	4	9	1	7	8	15	1	12	5
April - -	8·6	7·7	8·2	2·230	·440	3rd	16	0	0	3	0	19	1	3	12	8	14	8	3	2	3	7
May - -	8·4	6·7	7·5	3·420	·680	16th	16	1	2	4	2	15	2	8	13	10	6	3	7	3	7	5
June - -	7·1	5·4	6·3	1·960	·480	22nd	11	0	0	6	4	10	0	3	7	11	3	8	12	9	6	1
July - -	8·0	7·7	7·8	4·340	1·950	14th	16	0	0	6	1	16	0	3	1	0	2	5	11	13	23	4
August - -	8·5	6·5	7·5	5·550	·810	25th	23	0	0	6	0	16	1	5	3	5	5	8	9	11	11	5
September -	6·8	5·3	6·1	2·290	·700	2nd	14	0	0	1	5	11	1	14	11	4	4	4	5	4	11	3
October - -	6·8	5·0	5·9	3·060	·560	28th	19	0	2	0	5	10	2	3	2	7	4	11	11	13	10	1
November -	7·6	6·4	7·0	3·480	·380	21st	23	0	0	0	2	11	1	0	2	0	1	18	21	9	4	5
December -	8·2	7·2	7·7	2·860	·590	5th	23	5	0	0	2	17	1	3	5	0	4	7	14	16	8	5
Year -	7·6	6·5	7·0	41·030	—	—	233	23	10	27	29	164	21	55	75	46	56	97	144	92	117	48

[CHURCHSTOKE.

Long. 3° 5′ W. Lat. 52° 31′ N. Height above Mean Sea Level, 549 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·783	40·6	40·7	40·7	35·2	46·8	28·0	12th	54·7	19th	·232	·228	·230	89·8	88·7	89·3
February - -	·934	42·6	42·3	42·5	38·0	47·9	25·3	28th	55·1	14th	·240	·239	·240	86·3	86·5	86·4
March - -	·766	39·1	39·2	39·2	33·6	45·9	22·8	1st	54·6	2nd, 30th	·208	·209	·209	85·4	86·0	85·7
April - -	·769	42·6	42·8	42·7	37·2	49·5	27·0	20th	56·9	22nd	·238	·239	·239	86·5	86·0	86·3
May - -	29·883	47·0	44·8	45·9	39·1	54·3	28·5	3rd	67·2	31st	·263	·261	·262	80·9	86·5	83·7
June - -	30·001	57·7	56·5	57·1	49·4	66·5	40·6	24th	76·3	19th	·377	·392	·385	79·2	85·3	82·3
July - -	29·912	58·5	54·9	56·7	50·7	63·3	40·2	7th	76·1	30th	·422	·402	·412	85·5	92·1	88·8
August - -	29·870	58·5	55·2	56·9	50·5	64·3	40·0	12th	72·8	20th	·432	·410	·421	87·8	93·0	90·4
September -	30·094	51·4	48·5	50·0	42·5	58·1	33·1	22nd	62·7	12th	·325	·310	·318	85·1	90·0	87·6
October - -	30·002	47·8	46·4	47·1	39·7	55·8	27·0	18th	67·2	14th	·304	·291	·298	90·4	90·8	90·6
November -	29·615	43·4	43·8	43·6	38·7	50·3	30·5	25th	57·4	15th	·252	·259	·256	88·7	88·9	88·8
December -	30·040	40·0	39·6	39·8	34·2	45·5	26·7	28th	51·9	6th & 29th	·227	·221	·224	90·4	89·6	90·0
Year -	29·889	47·4	46·2	46·8	40·7	54·0	—	—	—	—	·293	·288	·291	86·3	88·6	87·5

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gales.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	7·1	5·6	6·4	4·395	·980	3rd	22	6	2	0	2	8	1	1	1	2	8	16	9	4	3	18
February - -	6·8	5·3	6·1	2·359	·650	19th	19	4	2	0	0	5	0	4	1	0	0	2	20	11	15	3
March - -	6·0	5·8	5·9	2·049	1·020	24th	21	5	0	0	6	11	0	2	1	1	6	3	10	12	6	21
April - -	8·7	7·6	8·2	2·343	·891	20th	14	1	1	0	0	19	0	1	7	15	14	4	4	2	3	10
May - -	7·5	5·3	6·4	2·605	·503	18th	15	0	1	1	3	11	0	9	7	7	7	6	7	5	4	10
June - -	6·1	5·0	5·6	1·824	·593	1st	12	0	0	0	4	6	0	2	3	2	7	8	11	6	4	17
July - -	5·9	7·1	6·5	3·665	1·560	14th	19	0	1	4	2	6	1	1	0	0	0	8	20	19	5	9
August - -	6·5	6·5	6·5	4·202	·637	8th	23	4	0	4	3	7	3	2	7	1	11	11	15	5	4	6
September -	7·0	4·9	6·0	2·344	1·135	2nd	5	0	0	0	2	9	0	3	3	3	7	2	10	8	7	17
October - -	5·6	4·9	5·3	2·677	·370	15th	22	0	1	0	3	4	2	0	3	2	5	7	19	8	2	16
November -	5·9	6·0	6·0	4·409	1·009	11th	20	1	2	1	2	6	1	0	1	2	3	16	20	8	2	8
December -	6·0	5·8	5·9	2·103	·467	28th	22	5	1	0	3	6	0	1	2	3	4	5	11	17	9	10
Year -	6·6	5·8	6·2	34·975	—	—	214	26	11	10	30	98	8	26	36	38	72	88	156	105	64	145

DARTMOOR.

Long. 3° 59′ W. Lat. 50° 33′ N. Height above Mean Sea Level, 1,372 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·904	41·0	40·6	40·8	36·3	45·3	31·0	13th	49·6	19th	·248	·243	·246	94·1	94·6	94·4
February - -	30·092	40·5	40·2	40·4	36·7	44·6	26·0	28th	49·6	7th	·241	·242	·242	93·4	94·4	93·9
March - -	29·871	38·1	37·1	37·6	32·8	43·1	24·2	1st	50·6	30th	·213	·212	·213	91·3	93·3	92·3
April - -	·797	42·6	40·0	41·3	36·4	46·9	28·5	17th	53·6	14th	·250	·238	·244	91·1	95·5	93·3
May - -	29·952	45·6	42·5	44·1	38·4	50·6	27·4	5th	60·2	25th	·264	·253	·259	85·6	91·6	88·6
June - -	30·084	57·2	52·1	54·7	48·2	62·1	41·6	7th	75·6	18th	·381	·360	·371	82·2	91·7	87·0
July - -	30·040	55·3	51·8	53·6	48·3	60·0	42·2	6th	74·2	30th	·378	·362	·370	85·5	93·1	89·3
August - -	29·967	56·5	53·7	55·1	50·1	60·7	39·6	24th	69·6	14th	·402	·394	·398	87·6	94·5	91·1
September -	30·153	51·3	48·1	49·7	43·7	56·2	36·0	22nd	62·0	16th, 26th	·328	·310	·319	86·8	91·8	89·3
October - -	30·117	48·3	45·8	47·1	41·0	52·9	32·0	17th	62·6	14th	·304	·288	·296	89·0	91·9	90·5
November -	29·769	43·3	42·5	42·9	37·8	47·8	31·5	25th	52·6	6th, 15th	·261	·261	·261	91·9	93·8	92·9
December -	30·165	38·9	38·8	38·9	35·1	43·3	29·0	28th	49·6	6th	·224	·226	·225	93·4	94·6	94·0
Year -	29·993	46·7	44·4	45·6	40·4	51·1	—	—	—	—	·291	·282	·287	89·3	93·4	91·4

DARTMOOR—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 1 foot above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gale.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	8·4	7·4	7·9	17·430	2·880	18th	28	3	3	1	0	16	9	2	2	2	4	7	17	13	6	9
February - -	7·8	7·5	7·7	6·860	1·130	12th	26	6	3	0	0	13	5	10	3	0	0	0	11	17	12	3
March - -	7·8	5·8	6·8	5·140	1·420	24th	23	10	1	1	2	12	4	7	5	2	1	7	4	7	17	12
April - -	9·1	6·7	7·9	9·370	2·970	15th	18	3	3	1	0	15	4	0	6	13	11	7	5	6	5	7
May - -	7·9	6·5	7·2	7·580	1·660	16th	17	1	0	0	0	14	5	2	7	14	8	5	9	11	4	2
June - -	6·8	6·3	6·6	4·060	1·040	6th	12	0	0	1	4	13	6	0	0	13	1	4	10	11	5	16
July - -	8·3	6·5	7·4	10·670	1·860	23rd	18	0	0	0	1	16	1	0	2	0	0	4	11	19	18	8
August - -	7·0	7·0	7·0	11·910	1·750	26th	23	0	0	2	1	13	2	2	1	8	2	4	25	7	11	2
September -	6·9	5·5	6·2	4·500	·920	13th	15	0	0	0	2	9	0	8	3	7	5	9	3	5	11	9
October - -	7·5	5·7	6·6	8·480	1·800	28th	21	0	3	0	3	12	3	2	0	9	3	3	19	5	10	11
November -	7·9	7·1	7·5	15·800	2·410	11th	25	3	3	2	1	13	7	2	1	1	2	6	17	9	15	7
December -	7·5	5·9	6·7	6·000	·960	28th	25	2	2	0	4	13	1	6	4	1	2	3	8	4	17	17
Year -	7·7	6·5	7·1	107·800	—	—	251	28	18	8	18	159	47	41	34	70	39	59	139	114	131	103

HAWES.

Long. 2° 11′ W. Lat. 54° 18′ N. Height above Mean Sea Level 800 feet.

Months.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·745	38·1	37·7	37·9	33·7	42·7	21·0	2nd	52·0	19th	·212	·203	·208	90·2	88·8	89·5
February - -	·832	39·7	38·0	38·9	34·7	43·2	15·8	28th	49·8	2nd	·218	·208	·213	85·1	86·6	85·9
March - -	·729	37·6	36·0	36·8	30·9	42·5	**13·9**	**1st**	52·2	30th	·187	·186	·187	81·6	86·0	83·8
April - -	·816	41·6	39·0	40·3	34·4	46·6	23·0	2nd	55·1	20th	·211	·213	·212	80·2	88·4	84·3
May - -	·891	45·4	42·0	43·7	36·8	51·1	21·5	4th	61·0	31st	·238	·236	·237	78·1	86·3	82·2
June - -	·986	56·0	52·0	54·0	46·4	63·6	36·5	24th	**77·7**	**20th**	·348	·336	·342	78·0	86·5	82·3
July - -	·842	56·0	53·1	54·6	48·7	61·1	35·0	6th	68·0	30th	·372	·369	·371	82·5	90·4	86·5
August - -	29·834	56·1	53·4	54·8	49·3	62·3	36·6	24th	70·2	6th	·380	·379	·380	83·9	81·5	82·7
September -	30·089	50·8	46·8	48·8	41·8	56·6	32·0	27th	63·3	26th	·296	·297	·297	79·5	92·1	85·8
October - -	29·917	46·0	44·9	45·5	39·3	53·7	29·0	18th	63·1	2nd	·274	·268	·271	87·3	89·0	88·2
November -	·536	41·3	42·1	41·7	38·2	46·6	28·3	24th	55·5	16th	·226	·238	·232	86·2	87·5	86·9
December -	29·957	38·1	38·6	38·4	34·4	42·5	25·0	25th	49·0	12th	·207	·211	·209	87·7	88·5	88·1
Year -	29·848	45·6	43·6	›	39·1	51·0	—	—	—	—	·264	·262	·263	83·4	87·6	85·5

HAWES—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 1 foot above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gales.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	8·3	7·5	7·9	11·430	2·140	29th	26	8	5	0	1	19	1	0	2	6	2	6	16	16	3	11
February -	8·5	6·0	7·3	5·770	·660	19th	23	8	3	0	2	14	0	4	0	1	0	1	15	26	8	1
March - -	8·1	6·3	7·2	3·820	·400	25th	25	9	5	1	2	14	0	4	1	8	1	0	5	18	6	19
April - -	8·5	8·4	8·5	3·430	·510	4th	18	6	2	4	1	19	0	1	6	26	7	3	4	4	0	9
May - -	8·6	7·0	7·8	3·540	·940	27th	19	3	4	1	1	18	0	6	9	15	1	0	8	12	1	10
June - -	7·9	6·6	7·3	4·190	1·310	1st	19	0	0	3	4	17	0	1	1	14	2	1	12	19	2	8
July - -	9·0	7·8	8·4	4·920	1·230	14th	25	0	1	3	0	20	0	0	0	2	2	3	14	30	4	7
August - -	8·8	8·6	8·7	8·900	1·230	20th	24	0	1	3	0	24	0	0	2	15	2	1	9	17	3	13
September -	7·1	6·2	6·7	4·070	1·700	13th	15	0	1	0	3	13	0	5	4	9	3	1	6	6	4	22
October - -	7·3	5·6	6·5	9·240	1·140	12th	23	0	3	0	4	13	1	1	0	2	1	3	19	15	4	17
November -	7·9	7·8	7·9	11·560	1·610	21st	26	4	3	1	2	18	0	0	0	1	1	5	23	19	3	8
December -	8·5	7·6	8·1	5·730	1·000	30th	23	5	4	1	0	18	0	1	1	3	1	1	10	27	3	15
Year -	8·2	7·1	7·7	76·600	—	—	266	43	32	17	20	207	2	23	26	102	23	25	141	209	41	140

HEREFORD.

Long. 2° 45′ W. Lat. 52° 5′ N. Height above Mean Sea Level, 274 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·786	41·1	41·8	41·5	36·6	48·5	28·1	12th	55·4	19th	·237	·234	·236	90·3	87·2	88·8
February - -	·930	43·5	43·9	43·2	39·4	49·0	27·0	28th	55·9	14th	·242	·236	·239	84·2	84·3	84·3
March - -	·760	41·2	39·9	40·6	34·8	47·6	**21·9**	**1st**	56·9	30th	·212	·213	·213	80·4	85·1	82·8
April - -	·756	44·8	43·8	44·3	38·8	51·7	28·2	20th	59·1	22nd	·246	·244	·245	82·5	84·4	83·5
May - -	·869	49·7	46·7	48·2	40·4	56·3	26·4	5th	63·2	31st	·255	·262	·259	71·2	81·1	76·2
June - -	·992	59·7	57·9	58·8	50·9	68·3	41·7	24th	**78·4**	**18th**	·386	·377	·382	75·7	78·1	76·9
July - -	·898	60·2	56·4	58·3	50·8	66·0	39·3	5th, 6th	78·1	29th	·388	·389	·389	74·1	84·7	79·4
August - -	29·860	60·6	57·1	58·9	51·7	66·6	38·9	24th	77·9	20th	·412	·405	·409	77·9	86·1	82·0
September -	30·077	52·9	50·4	51·7	44·6	60·0	34·7	5th	64·9	15th	·325	·314	·320	80·9	85·3	83·1
October - -	30·001	47·6	46·8	47·2	39·8	57·2	23·4	18th	66·0	14th	·290	·276	·283	86·8	87·0	86·9
November -	29·624	44·3	44·1	44·2	38·7	52·0	30·8	14th	57·9	9th	·259	·257	·258	87·8	87·6	87·7
December -	30·035	39·9	39·5	39·7	34·6	46·3	27·2	25th	54·7	29th	·222	·217	·220	89·1	88·8	89·0
Year -	29·882	48·8	47·3	48·1	41·8	55·8	—	--	—	—	·290	·285	·288	81·7	85·0	83·4

HEREFORD—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 1 foot 4 inches above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gale.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	7·5	6·4	7·0	3·458	·760	3rd	28	3	0	0	1	12	0	0	2	2	2	12	5	8	5	26
February - -	6·9	6·4	6·7	1·548	·360	13th	19	3	0	0	3	11	0	8	1	0	0	1	10	16	11	9
March - -	6·0	5·1	5·6	2·048	·610	24th	22	0	0	1	6	7	0	7	2	1	5	3	0	11	7	26
April - -	8·9	6·9	7·9	2·627	·540	20th	19	2	0	1	1	18	0	0	3	17	8	6	1	4	1	20
May - -	7·7	5·8	6·8	2·395	·450	11th	14	0	0	0	3	15	0	2	13	7	5	3	5	6	1	20
June - -	6·8	5·0	5·9	0·881	·310	21st	10	0	0	0	4	8	0	1	3	6	3	4	10	7	2	24
July - -	7·5	5·9	6·7	2·906	·890	14th	15	0	1	2	0	10	0	1	0	0	1	4	10	21	1	24
August - -	7·2	5·3	6·3	4·580	·980	25th	22	0	0	2	3	11	0	1	1	3	1	4	10	11	5	26
September -	6·7	4·5	5·6	2·018	·740	2nd	10	0	0	0	4	6	0	8	1	5	1	3	6	2	3	31
October - -	5·8	3·5	4·7	1·998	·270	22nd	19	0	0	0	5	5	0	1	0	0	1	7	7	14	2	30
November -	6·2	4·9	5·6	2·840	·994	11th	27	2	0	1	3	7	0	1	1	0	0	13	10	7	3	25
December -	6·6	4·8	5·7	1·743	·560	28th	21	4	0	0	6	10	0	0	2	0	2	1	3	13	6	35
Year -	7·0	5·4	6·2	29·042	—	—	226	14	1	7	39	120	0	30	29	41	29	61	77	120	47	296

HILLINGTON, NORFOLK.

Long. 0° 33′ E. Lat. 52° 48′ N. Height above Mean Sea Level, 89 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·808	40·2	39·9	40·1	34·9	46·4	25·2	27th	56·1	19th	·232	·235	·234	91·5	92·7	92·1
February - -	·850	41·4	41·2	41·3	36·7	47·5	25·0	28th	54·8	14th	·245	·237	·241	91·9	89·8	90·9
March - -	·725	39·5	38·2	38·9	33·0	46·9	22·3	11th	55·3	28th	·220	·212	·216	88·7	89·5	89·1
April - -	* —	46·1	42·4	44·3	38·2	51·7	27·2	25th	60·9	20th	·266	·255	·261	85·0	92·7	88·9
May - -	29·894	50·3	44·4	47·4	39·0	56·9	24·4	6th	69·3	31st	·286	·268	·277	78·2	89·8	84·0
June - -	30·032	63·2	56·0	59·6	48·5	72·3	40·1	8th	**82·1**	**29th**	·407	·387	·397	70·6	86·0	78·3
July - -	29·863	62·0	57·8	59·9	50·6	69·6	37·7	8th	81·6	31st	·438	·427	·433	79·0	88·8	83·9
August - -	29·840	61·7	57·3	59·5	51·6	71·3	36·8	24th	79·5	20th	·442	·433	·438	80·2	91·3	85·8
September -	30·049	55·2	48·3	51·8	43·1	62·1	33·4	27th	71·6	11th	·371	·329	·350	85·1	96·0	90·6
October - -	30·002	49·8	45·4	47·6	38·9	57·6	**21·5**	**19th**	69·1	14th	·316	·281	·299	87·5	90·7	89·1
November -	29·625	42·8	42·3	42·6	36·4	49·9	25·3	24th	57·7	6th	·261	·259	·260	93·0	93·9	93·5
December -	29·981	37·8	38·2	38·0	33·7	44·0	22·1	26th	51·7	29th	·221	·223	·222	95·7	94·8	95·3
Year -	—	49·2	46·0	47·6	40·4	56·4	—	—	—	—	·309	·296	·303	85·5	91·3	88·4

HILLINGTON, NORFOLK—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 1 foot above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gale.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	7·5	6·1	6·8	3·266	1·050	3rd	23	0	1	1	2	13	4	3	1	6	4	7	23	6	7	5
February - -	7·6	5·9	6·8	2·774	·460	20th	20	6	3	0	3	12	3	4	0	0	0	3	10	14	24	1
March - -	8·2	7·0	7·6	1·934	·310	21st	23	6	3	2	0	14	2	6	7	0	9	4	13	6	16	1
April - -	8·3	7·7	8·0	2·293	·548	21st	16	0	1	2	0	18	2	0	16	7	16	7	6	2	6	0
May - -	7·7	6·6	7·2	1·393	·307	19th	16	2	4	2	2	14	1	6	18	4	8	2	16	3	3	2
June - -	5·3	5·5	5·4	1·550	·535	30th	11	0	0	2	4	8	0	4	4	12	8	2	25	3	2	0
July - -	7·1	7·6	7·4	2·454	·425	14th	17	0	0	5	0	11	0	1	1	0	1	4	26	14	15	0
August - -	7·5	6·8	7·2	3·246	1·025	27th	18	0	0	3	0	14	0	1	6	0	7	5	22	8	13	0
September -	7·4	4·4	5·9	1·395	·234	3rd	15	0	1	0	1	7	1	10	11	6	2	2	8	3	14	4
October - -	5·1	3·6	4·4	2·058	·585	29th	15	0	0	0	10	6	1	4	2	5	1	2	31	12	2	3
November -	6·3	5·0	5·7	3·393	·965	11th	19	0	1	0	5	9	2	0	1	0	2	9	35	4	9	0
December -	6·6	6·6	6·6	1·902	·530	28th	19	5	0	0	5	15	0	3	1	0	5	6	22	5	15	1
Year -	7·1	6·1	6·6	27·658	—	—	212	19	14	17	32	141	16	42	1	40	65	53	237	80	126	17

KELSTERN.

Long. 0° 7′ W. Lat. 53° 24′ W. Height above Mean Sea Level, 388 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Temp.	Day.	Temp.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·788	38·5	38·4	38·5	34·3	44·7	27·8	27th	54·7	19th	·228	·225	·227	95·8	94·9	95·4
February - -	·845	39·5	38·4	39·0	34·5	46·2	18·9	28th	55·1	14th	·235	·228	·232	94·0	94·4	94·2
March - -	·734	37·8	36·7	37·3	32·3	45·5	18·8	23rd	54·6	28th	·210	·206	·208	91·2	92·4	91·8
April - -	·808	43·2	40·8	42·0	37·9	48·2	31·3	25th	59·2	4th	·249	·244	·247	88·9	94·8	91·9
May - -	29·886	47·3	43·4	45·4	39·2	52·4	28·0	4th	63·5	31st	·297	·277	·287	90·0	96·3	93·2
June - -	30·006	59·2	54·4	56·8	48·1	65·8	40·8	8th	75·8	29th	·414	·395	·405	82·4	92·7	87·6
July - -	29·864	60·3	55·4	57·9	50·0	66·9	41·1	8th	78·1	29th	·427	·408	·418	81·6	91·8	86·7
August - -	29·840	59·2	55·5	57·4	51·1	66·0	38·0	24th	74·7	20th	·441	·424	·433	87·1	94·6	90·9
September -	30·071	52·7	47·6	50·2	43·4	58·8	37·1	25th	67·2	11th	·346	·322	·334	87·1	96·4	91·8
October - -	29·966	47·9	45·1	46·5	39·9	54·5	26·2	18th	66·1	14th	·293	·279	·286	87·0	91·5	89·3
November -	·599	41·6	41·2	41·4	36·6	48·4	29·2	24th	56·0	7th	·244	·246	·245	91·4	93·3	92·4
December -	29·987	36·6	37·4	37·0	33·3	42·3	23·9	27th	48·8	29th	·208	·216	·212	94·8	94·6	94·7
Year -	29·866	47·0	44·5	45·8	40·1	53·3	—	—	—	—	·299	·289	·294	89·3	94·0	91·7

KELSTERN—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 1 foot above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gales.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	6·4	6·3	6·4	3·981	1·237	3rd	21	2	1	0	2	9	1	1	4	2	2	13	17	10	7	6
February - -	6·8	5·9	6·4	2·615	·667	25th	20	5	0	0	3	9	0	4	0	0	1	1	14	17	17	2
March - -	6·5	6·0	6·3	2·119	·466	24th	21	7	0	0	3	14	0	4	6	2	4	4	13	15	13	1
April - -	8·2	8·2	8·2	3·015	·535	9th	22	0	0	2	1	21	0	4	8	15	12	8	6	0	5	2
May - -	8·2	6·5	7·4	1·855	·374	17th	19	1	0	2	0	14	0	5	13	12	5	3	7	11	2	4
June - -	5·7	5·2	5·5	1·222	·207	21st	10	0	0	2	5	5	1	3	5	14	1	6	13	11	3	4
July - -	7·2	6·3	6·8	2·684	·604	17th	16	0	0	3	1	11	0	3	2	0	0	10	20	14	9	4
August - -	6·8	6·0	6·4	4·106	·920	8th	18	0	0	4	2	10	0	4	4	3	7	9	15	14	6	0
September -	6·6	4·0	5·3	4·973	1·742	3rd	16	0	0	1	5	9	0	11	9	5	4	2	8	4	8	9
October - -	5·5	4·6	5·1	2·073	·723	29th	19	0	0	0	8	10	0	3	4	3	3	9	21	9	6	4
November -	5·0	4·4	4·7	2·729	·510	11th	18	0	0	0	8	5	2	1	1	0	3	14	29	9	3	0
December -	6·1	5·3	5·7	2·270	·337	30th	16	4	0	0	9	11	1	2	4	2	3	8	20	15	7	1
Year -	6·6	5·7	6·2	33·642	—	—	216	19	1	14	47	128	5	45	60	58	45	87	185	129	86	37

LLANDUDNO.

Long. 3° 50′ W. Lat. 53° 21′ N. Height above Mean Sea Level, 89 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·723	43·6	43·4	43·5	38·5	49·2	31·0	12th	56·2	19th	·233	·231	·232	82	82	82
February - -	·890	45·1	44·0	44·6	41·1	49·0	28·5	28th	56·0	2nd	·251	·241	·246	83	84	84
March - -	·735	44·2	42·0	43·1	37·2	48·9	**26·3**	**1st**	54·5	29th	·233	·229	·231	80	86	83
April - -	·747	46·7	44·3	45·5	40·5	51·8	34·5	20th	59·8	22nd	·246	·244	·245	77	84	80
May - -	·861	50·9	47·0	48·9	43·1	57·3	34·0	4th, 5th	68·5	8th	·272	·262	·267	73	81	77
June - -	·965	60·8	57·4	59·1	52·9	67·4	47·0	24th	**80·9**	**21st**	·369	·365	·367	69	77	73
July - -	·867	60·4	57·0	58·7	54·3	66·4	47·0	6th	74·1	30th	·407	·393	·400	77	85	81
August - -	29·822	60·4	57·3	58·9	54·1	66·2	47·0	23rd	74·4	6th	·413	·401	·407	78	85	82
September -	30·075	55·9	52·7	54·3	49·2	60·1	42·5	8th	68·9	10th	·355	·342	·349	79	86	82
October - -	29·933	52·9	50·5	51·7	46·3	58·0	37·3	18th	69·0	14th	·324	·306	·315	81	83	82
November -	·537	46·8	47·0	46·9	42·9	52·4	35·0	24th	62·0	15th	·264	·267	·266	82	83	83
December -	29·985	43·5	43·7	43·6	39·7	48·1	33·6	28th	55·5	12th	·243	·238	·240	86	84	85
Year -	29·845	50·9	48·9	49·9	45·0	56·2	—	—	—	—	·301	·293	·297	78·9	83·3	81·1

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gale.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	6·1	6·4	6·3	5·140	·830	16th	24	2	2	0	4	9	2	0	1	5	2	5	16	27	6	0
February - -	7·1	6·6	6·8	4·140	·910	25th	22	2	5	0	1	12	0	14	0	0	0	2	5	32	3	0
March - -	5·9	6·2	6·1	2·620	·370	9th	21	1	4	0	5	11	2	8	1	10	1	1	6	30	5	0
April - -	7·7	6·8	7·2	2·600	·475	8th	15	0	2	0	1	14	0	3	2	26	9	7	4	7	2	0
May - -	6·5	5·1	5·8	2·315	·552	10th	13	0	0	2	7	10	2	3	5	31	3	6	3	11	0	0
June - -	6·6	7·1	6·9	1·590	·325	18th	11	0	0	1	4	16	1	3	6	11	3	4	9	22	2	0
July - -	8·4	8·0	8·2	5·280	1·650	15th	19	0	3	3	1	22	0	2	1	1	0	1	7	42	8	0
August - -	7·5	5·7	6·6	5·770	1·025	21st	22	0	0	1	6	14	1	6	3	6	9	5	6	21	6	0
September -	7·2	5·1	6·1	4·295	1·780	14th	15	0	0	0	5	12	2	7	9	11	4	3	5	17	4	0
October - -	6·6	5·5	6·1	3·365	·586	22nd	16	0	3	0	4	11	5	2	2	3	1	5	13	32	4	0
November -	7·4	5·3	6·3	6·350	·890	11th	22	0	4	1	3	11	1	0	0	1	0	9	18	25	7	0
December -	7·8	6·0	6·9	3·875	1·030	30th	23	1	8	0	2	15	0	2	1	5	2	5	12	24	11	0
Year -	7·1	6·2	6·6	47·340	—	—	223	6	31	8	43	157	16	50	31	110	34	53	104	290	58	0

MARLBOROUGH, WILTS.

Long. 1° 43′ W. Lat. 51° 25′ N. Height above Mean Sea Level, 471 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·845	41·3	40·9	41·1	36·5	47·9	28·8	12th	53·3	19th	·247	·237	·242	93·1	91·0	92·1
February - -	·977	42·5	41·7	42·1	38·4	48·6	24·7	28th	56·2	7th	·245	·245	·245	88·7	91·3	90·0
March - -	·789	40·6	38·9	39·8	33·6	47·9	20·8	1st	57·8	30th	·212	·213	·213	82·0	88·3	85·2
April - -	·771	45·1	43·6	44·4	38·7	52·2	30·2	17th	59·5	22nd	·252	·252	·252	83·3	88·3	85·8
May - -	29·893	49·7	46·4	48·1	39·9	56·8	25·8	5th	64·5	26th	·262	·261	·262	73·1	81·9	77·5
June - -	30·027	61·6	58·2	59·9	50·4	70·5	40·7	24th	81·8	18th	·379	·379	·379	69·6	77·7	73·7
July - -	29·939	60·7	56·5	58·6	50·4	67·9	41·4	7th	82·5	31st	·415	·407	·411	78·6	88·2	83·4
August - -	29·884	61·8	56·7	59·3	52·4	68·3	36·2	24th	77·3	20th	·435	·417	·426	78·7	89·9	84·3
September -	30·094	53·9	49·3	51·6	43·8	61·1	33·1	25th	66·9	6th	·336	·313	·325	80·6	88·7	84·7
October - -	30·046	48·6	45·7	47·2	39·2	57·6	24·5	18th	66·1	14th	·293	·279	·286	84·9	89·8	87·4
November -	29·690	43·3	43·1	43·2	38·1	51·5	31·2	26th	57·4	1st	·263	·265	·264	92·1	93·0	92·6
December -	30·075	38·3	39·1	38·7	34·6	45·1	26·7	26th	51·9	6th	·221	·226	·224	93·6	93·5	93·6
Year -	29·919	49·0	46·7	47·9	41·3	56·3	—	—	—	—	·297	·292	·295	83·2	88·5	85·9

MARLBOROUGH, WILTS—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 1 foot above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gales.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	7·5	6·5	7·0	5·653	·842	6th	28	0	0	0	2	12	3	1	3	1	1	17	12	12	1	14
February - -	7·1	7·4	7·3	1·608	·358	19th	19	3	2	0	3	14	2	0	0	0	0	1	14	23	15	3
March - -	6·3	6·3	6·3	2·414	·373	23rd	19	5	3	2	5	11	0	8	1	1	3	7	6	20	6	10
April - -	9·0	6·8	7·9	3·670	·547	3rd	19	0	2	0	0	18	0	9	4	16	4	8	1	6	0	12
May - -	7·2	6·2	6·7	2·588	·466	12th	14	0	0	0	2	13	0	14	3	5	1	4	5	8	1	21
June - -	5·8	4·7	5·3	1·115	·564	1st	8	0	0	2	8	8	0	2	4	8	2	7	13	2	2	20
July - -	7·9	6·2	7·1	5·031	1·954	14th	20	0	0	2	0	13	0	0	0	0	1	2	18	20	4	17
August - -	7·8	5·0	6·4	4·805	·900	14th	18	0	0	0	2	11	0	3	1	3	1	6	17	10	2	19
September -	6·9	5·1	6·0	2·954	1·258	3rd	6	0	0	0	6	13	0	9	6	3	0	2	9	2	3	26
October - -	5·0	4·5	4·8	2·493	·513	29th	15	0	1	0	8	7	0	6	1	2	0	3	2	6	2	18
November -	7·1	4·7	5·9	7·016	1·645	11th	23	0	1	1	5	10	2	0	1	1	1	6	25	15	0	11
December -	7·0	6·0	6·5	2·391	·530	28th	19	3	0	0	5	14	0	4	0	0	0	4	9	23	4	18
Year -	7·1	5·8	6·5	41·738	—	—	208	11	9	7	46	144	7	56	24	40	14	67	153	147	40	189

RAMSGATE.

Long. 1° 25′ E. Lat. 51° 20′ N. Height above Mean Sea Level, 105 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Temp.	Day.	Temp.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·886	43·7	44·2	44·0	39·0	48·8	30·0	27th	55·6	9th	·270	·268	·269	92·9	90·9	91·9
February - -	·920	43·9	43·4	43·7	38·5	49·3	25·9	28th	57·2	7th	·267	·254	·261	91·0	87·9	89·5
March - -	·743	†—	—	—	35·9	47·1	25·7	1st	55·9	29th	†—	—	—	†—	—	—
April - -	·762	47·4	45·3	46·4	42·4	51·8	38·1	19th	61·4	9th	·273	·270	·272	83·5	89·0	86·3
May - -	29·858	51·3	47·7	49·5	44·5	56·0	33·0	3rd	62·7	31st	·287	·283	·285	74·9	84·3	79·6
June - -	30·015	62·0	58·1	60·1	53·4	68·1	45·2	7th	76·3	19th	·421	·396	·409	75·6	82·6	79·1
July - -	*—	*—	—	—	—	—	44·3	7th	81·4	29th	*—	—	—	*—	—	—
August - -	29·871	64·1	60·4	62·3	56·6	69·4	44·6	24th	78·2	19th	·457	·449	·453	76·3	85·1	80·7
September -	30·042	56·9	54·2	55·6	50·5	62·0	44·5	27th	69·0	10th	·358	·343	·351	77·1	81·0	79·1
October - -	30·023	52·1	50·5	51·3	44·9	57·4	30·4	18th	63·4	14th	·304	·302	·303	77·7	81·7	79·7
November -	29·711	47·1	46·8	47·0	41·5	52·7	32·5	26th	59·1	5th	·290	·289	·290	88·4	88·8	88·6
December -	30·042	40·7	40·6	40·7	36·9	45·5	30·0	27th	52·5	29th	·232	·233	·233	89·9	90·8	90·4
Year -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

* Observations taken on only 25 days.

† Observations taken on only 18 days.

RAMSGATE—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 6 inches above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gales.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	7·9	5·4	6·7	4·630	·960	8th	19	0	1	0	2	13	12	4	4	0	1	24	12	8	4	5
February - -	7·6	7·1	7·4	1·890	·250	20th	18	5	1	0	2	14	5	2	1	0	0	1	20	19	13	0
March - -	7·3	6·5	6·9	3·145	·730	20th	21	4	5	0	1	11	6	4	8	2	4	1	21	13	7	2
April - -	7·3	7·0	7·2	2·290	·530	4th	17	1	2	2	0	10	7	4	22	8	3	2	15	1	4	1
May - -	7·5	6·5	7·0	2·413	·414	19th	19	0	4	0	0	10	2	6	20	1	6	0	20	1	7	1
June - -	5·3	5·7	5·5	1·663	1·010	11th	9	0	0	2	4	4	2	0	18	4	5	4	19	5	5	0
July - -	*—	—	—	1·701	·504	14th	*14	0	0	2	1	5	0	*0	0	1	1	5	25	8	9	1
August - -	6·0	6·8	6·4	2·051	·645	7th	14	0	0	2	2	8	3	0	7	2	6	4	29	4	10	0
September -	6·1	5·1	5·6	1·389	·495	3rd	12	0	0	0	2	10	1	1	14	2	2	1	11	.4	21	4
October - -	6·0	5·9	6·0	2·221	·748	24th	14	0	3	0	2	6	4	2	8	0	3	4	23	10	10	2
November -	5·9	5·8	5·9	4·650	1·262	29th	21	0	2	0	4	10	8	0	1	0	3	4	35	8	4	5
December -	7·2	5·6	6·4	2·721	·659	28th	16	3	0	0	5	12	1	0	6	0	4	5	15	16	7	9
Yaer -	—	—	—	30·764	—	—	194	13	18	8	25	113	51	23	109	20	38	55	245	97	101	30

* Observations taken on only 25 days.

STRATHFIELD TURGISS.

Long. 1° 0′ W. Lat. 51° 20′ N. Height above Mean Sea Level, 196 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January - -	29·854	42·2	41·4	41·8	36·4	48·7	26·7	21st	54·4	19th	·252	·240	·246	91·1	90·5	90·8
February - -	·963	43·7	42·5	43·1	38·6	49·2	25·0	28th	57·6	7th	·244	·241	·243	84·4	86·1	85·3
March - -	·779	41·7	39·5	40·6	33·5	48·6	21·7	11th	58·7	29th	·214	·219	·217	79·3	88·4	83·9
April - -	·773	47·5	44·4	46·0	39·1	54·1	28·9	20th	60·2	10th, 22nd	·258	·247	·253	78·3	83·9	81·1
May - -	29·893	51·3	47·0	49·2	39·9	58·1	26·0	5th	65·3	26th	·270	·264	·267	71·2	80·6	75·9
June - -	30·031	63·7	58·3	61·0	49·3	72·5	41·9	24th	85·4	18th	·390	·388	·389	66·0	79·2	72·6
July - -	29·935	62·4	57·8	60·1	50·4	69·4	39·3	8th	83·2	31st	·406	·410	·408	72·0	85·1	78·6
August - -	29·880	63·4	57·5	60·5	52·0	69·6	35·4	24th	79·1	20th	·428	·402	·415	73·2	84·5	78·9
September -	30·088	54·0	49·4	51·7	43·3	62·7	30·7	25th	67·5	6th	·342	·317	·330	81·7	89·3	85·5
October - -	30·047	49·4	45·2	47·3	37·6	58·9	24·3	18th	68·6	14th	·289	·274	·282	81·7	89·0	85·4
November -	29·696	44·8	43·7	44·3	37·4	52·4	28·8	17th	58·2	6th	·265	·264	·265	87·7	90·8	89·3
December -	30·066	38·9	39·3	39·1	34·3	46·0	25·7	28th	55·1	6th	·222	·223	·223	90·1	91·3	90·7
Year -	29·917	50·3	47·2	48·8	41·0	57·5	—	—	—	—	·298	·291	·295	79·7	86·6	83·2

STRATHFIELD TURGISS—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 1 foot above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind, No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gale.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	7·3	6·9	7·1	3·914	·540	10th	25	1	0	0	1	13	0	4	1	1	7	11	13	5	10	10
February - -	6·9	6·1	6·5	1·404	·311	19th	16	1	0	0	4	12	0	11	1	0	0	2	8	21	11	2
March - -	5·8	6·4	6·1	2·046	·340	23rd	19	6	0	3	4	12	0	10	5	0	6	2	11	13	10	5
April - -	8·6	6·9	7·8	2·479	·528	27th	17	2	0	2	0	17	0	3	20	3	8	7	8	4	5	2
May - -	7·4	5·8	6·6	2·128	·447	16th	14	0	0	1	2	13	0	5	13	6	4	6	9	9	4	6
June - -	5·0	4·7	4·9	1·494	1·038	21st	7	0	0	4	8	6	0	0	0	9	9	5	18	9	3	7
July - -	6·9	5·8	6·4	2·643	·720	14th	12	0	2	5	3	10	0	0	0	0	1	2	17	33	4	5
August - -	6·3	5·9	6·1	2·251	·684	21st	12	0	0	1	3	10	0	0	1	0	6	6	19	15	13	2
September -	7·3	5·0	6·2	1·348	·720	3rd	7	0	0	0	5	12	0	7	3	12	4	1	7	8	15	3
October - -	4·5	4·5	4·5	1·716	·348	29th	12	0	0	2	9	8	0	3	3	2	1	6	18	11	6	12
November -	6·4	5·2	5·8	5·153	·980	11th	22	0	2	3	5	11	0	0	2	0	1	10	16	12	7	12
December -	6·7	6·7	6·7	1·677	·477	28th	17	4	0	0	3	14	0	2	3	0	4	3	12	13	11	14
Year -	6·6	5·8	6·2	28·253	—	—	180	14	4	21	47	138	0	45	52	33	51	61	156	153	99	80

WAKEFIELD.

Long. 1° 30′ W. Lat. 53° 41′ N. Height above Mean Sea Level, 96 feet.

1877.	Mean Pressure.	Air Temperature.									Tension of Vapour.			Relative Humidity.		
		9 a.m.	9 p.m.	Mean.	Means of		Absolute Min. and Max.				9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.
					Min.	Max.	Min.	Day.	Max.	Day.						
	ins.	°	°	°	°	°	°		°		in.	in.	in.	%	%	%
January -	29·764	41·2	40·6	40·9	36·1	46·9	29·2	12th, 23rd	58·6	19th	·240	·232	·236	91·4	90·3	90·9
February - -	·851	43·1	42·8	43·0	38·6	48·8	22·2	27th	55·6	15th	·250	·248	·249	87·7	87·6	87·7
March - -	·736	39·5	39·6	39·6	34·2	46·1	18·1	1st	57·0	30th	·213	·216	·215	86·3	87·4	86·9
April - -	·804	43·9	43·3	43·6	37·7	49·2	28·4	25th	57·2	4th	·243	·251	·247	84·6	88·5	86·6
May - -	·883	48·3	47·0	47·7	40·9	54·9	24·8	6th	63·6	31st	·271	·285	·278	79·9	87·1	83·5
June - -	·997	59·3	57·9	58·6	50·2	67·9	42·1	16th	77·8	3rd	·353	·364	·359	70·4	75·5	73·0
July - -	·853	60·4	57·6	59·0	52·4	65·9	39·8	5th	74·5	30th	·384	·385	·385	72·8	80·6	76·7
August - -	29·831	60·0	57·9	59·0	52·7	66·9	40·6	24th	74·8	6th	·397	·409	·403	76·6	84·3	80·5
September -	30·076	52·9	50·3	51·6	44·3	59·6	32·1	27th	65·8	11th	·315	·321	·318	78·7	87·6	83·2
October - -	29·944	47·8	47·0	47·4	40·5	56·6	28·2	18...	67·8	14th	·277	·274	·276	83·1	84·0	83·6
November -	·567	44·2	45·0	44·6	39·6	51·6	28·2	24th	60·2	16th	·247	·258	·253	84·1	84·9	84·5
December -	29·972	40·7	40·6	40·7	36·1	46·1	26·4	26th	53·4	29th	·228	·222	·225	89·0	86·8	87·9
Year -	29·857	48·4	47·5	48·0	41·9	55·0	—	—	—	—	·285	·289	·287	82·1	85·4	83·8

WAKEFIELD—*Continued.*

Thermometers 4 feet above ground. Rain-gauge 1 foot above ground.

1877.	Amount of Cloud.			Rainfall.			Weather, No. of Days of							Wind. No. of Observations of								
	9 a.m.	9 p.m.	Mean.	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Overcast.	Gale.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				ins.	ins.																	
January - -	6·5	—	—	3·490	1·060	3rd	22	0	0	0	0	0	0	4	2	5	6	19	10	14	2	*0
February - -	6·1	—	—	1·800	·580	25th	20	0	0	0	0	0	0	5	0	0	0	5	15	21	10	*0
March - -	6·6	6·4	6·5	3·210	·670	24th	18	1	2	1	2	13	0	6	4	4	4	8	6	21	9	*0
April - -	8·5	7·0	7·8	3·230	·800	22nd	17	0	1	2	1	15	1	3	9	13	8	2	2	1	1	21
May - -	7·3	6·7	7·0	2·470	·550	16th	15	0	1	1	2	16	0	11	7	8	1	2	8	6	1	18
June - -	6·3	4·7	5·5	1·750	·470	1st	10	0	0	1	3	10	1	1	5	11	1	7	7	13	0	15
July - -	7·7	6·2	7·0	2·920	·880	14th	18	0	0	2	1	12	0	1	0	0	0	5	12	29	3	12
August - -	6·7	7·4	7·1	4·060	·750	25th	19	0	0	3	1	12	0	4	2	2	1	10	8	14	8	13
September -	5·3	5·6	5·5	2·610	·970	2nd	12	0	0	0	3	7	1	8	5	3	1	0	6	8	8	21
October - -	5·8	4·4	5·1	2·930	·690	23rd	17	0	0	0	4	6	0	2	0	0	2	7	11	14	2	24
November -	4·9	5·0	5·0	2·170	·460	21st	19	0	5	1	5	7	1	0	1	0	2	11	17	10	0	19
December -	6·7	6·1	6·4	2·370	·810	30th	17	2	0	0	2	10	0	3	0	0	0	3	11	20	6	19
Year -	6·5	—	—	33·010	—	—	204	3	9	11	24	108	4	48	35	46	26	79	113	171	50	162

* NOTE.—During January, February, and March the force of the wind was not observed; it is probable that sometimes when there was no wind the direction of the vane was entered.

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING MARCH 31, 1878.

REMARKS ON THE WEATHER DURING THE QUARTER ENDING MARCH 31ST, 1878.

By JAMES GLAISHER, Esq., F.R.S., *&c.*

The month of January was unusually mild, the sky was generally overcast, and there was very e sunshine, the fall of rain was less than the average, and the fall of snow till after the 24th was ll in amount. Till the 24th day, with the exception of the 10th, 11th, 12th, and 13th, the perature was every day above its average; and on the 14th, 15th, 21st, and 22nd, to a very e amount; the temperatures on the 21st and 22nd, both day and night, were extremely high, the average excess of daily temperature from January 1st to the 24th was 5°·1. On the 1 a cold period set in, and snow fell daily, chiefly in the north, but on the 25th it fell generally the country, extending as far south as Guernsey. On January 28th there was a slight shock arthquake, which was felt at Jersey, Isle of Wight, London, Brighton, Southampton, Havre, en, and Paris, and many other places. The cold weather which set in on January 25th, inued to February 12th, and the average deficiency of temperature for these 19 days was 2°·6 y. On February 13th a very warm period set in, and on the 17th there was a remarkably high temperature at all stations, the temperature at some exceeding 60°, and at many being nearly al to this amount; this very warm period continued till March 13th, the first day of March g distinguished for high temperature, and for the 28 days ending March 13th, the daily excess mperature was on the average as large as 7°; then there occurred 5 days of low temperature, w falling over the Midland and Northern Counties daily; the average daily deficiency of perature was 4¼°; then 4 days (March 18th–22nd) of warmth followed, the excess of tempera- being 6¼°. Up to this time the weather for the whole quarter had been exceedingly mild, but the 23rd day of March bad weather set in with severity, and from this day to the end of the rter the weather was bitterly inclement; snow fell on every day, accompanied with very cold nd N.E. winds, and no more trying weather during the winter was experienced than on March 1 and 30th; the snow on these days was large in amount, and was general over the whole ntry, all the railways in Devonshire being blocked, and telegraphic communications being ywhere interrupted. The average deficiency of temperature for the 10 days ending March 31st as large as 6¾° daily.

The readings of the barometer were high upon the whole quarter, in January the mean reading 29·979 inches, and this was slightly exceeded in the years 1855, 1858, 1859, 1864, and 1874. February the mean reading was 30·101 inches, and there are only two Februaries back to 1841 which this reading was exceeded, viz.: in 1849 when it was 30·106 inches, and in 1863 when as 30·141 inches.

The readings of the barometer in the vicinity of London were above their averages from the to the 6th of January, below on the 7th and 8th, above from the 9th to the 22nd, below on the e following days, above on the 26th and 27th, below on the 28th, and again above from the h to the end of the month. The mean reading for the month was 29·979 ins., being 0·231 in. ve the average. During the first nine days of February the barometer readings were above ir averages; the mean amount in excess of the average for these nine days was no less than 6 in.; the reading on the 10th was the same as the average, the readings on the 11th and h were above their averages, and on the 13th and 14th they were below, from the 15th to the 1 they were all above their averages, and on the 27th and 28th they were respectively 0·13 in. 0·07 in. below. The mean reading for the month was 30·101 ins., being 0·308 in. above average. The readings of the barometer from the 1st to the 10th of March were alternately ve and below their averages, from the 11th to the 21st they were all above, and from the d to the end of the month they were below their averages, with the exception of the 26th, ch was 0·11 in. above. The mean reading for the month was 29·890 ins., being 0·154 in. ve the average.

At Greenwich *the mean temperature* of January was below that of December by 0°·4; that of ruary was above that of January by 1°·8; and that of March was below that of February by 1. (From the preceding 37 years' observations the *mean temperature* of January is lower 1 that of December by 1°·5; that of February is higher than that of January by 0°·6; and that March is higher than that of February by 2°·3.)

The mean temperature of the air for January below that of December over the whole country 0°·6; that of February above that of January was 1°·8; and that of March below that of ruary was 0°·1.

The mean temperature of the air for January was 40°·4, being 3°·9 and 1°·7 above the rages of the preceding 107 years, and 37 years respectively. It was 2°·3 lower than the ue in 1877.

The mean temperature of the air for February was 42°·2, being 3°·5 and 2°·9 above the rages of the preceding 107 years, and 37 years respectively. It was 1°·3 lower than the ue in 1877.

The mean temperature of the air for March was 42°·0, being 0°·9, and 0°·4 above the rages of the preceding 107 years, and 37 years respectively. It was 1°·3 higher than the value 877.

The mean temperature of the air for the quarter was 41°·5, being 2°·8 and 1°·7 above the rages of the preceding 107 years and 37 years respectively.

The mean high day temperatures of the air were 1°·2 and 1°·6 above their respective aver January and February, but 0°·3 below in March.

The following table contains the highest and lowest temperatures registered at all the stations on January 21st and 22nd, February 17th, and March 1st, which were remarkable for their high temperatures; and on March 29th and 30th, which were remarkable for their low temperatures.

TABLE of MAXIMUM and MINIMUM TEMPERATURES of the AIR at the several STATIONS on January 21st and 22nd, February 17th, and March 1st, 29th, and 30th.

Names of Stations.	JAN. 21st.		JAN. 22nd.		FEB. 17th.		MARCH 1st.		MARCH 29th.		MARCH 30th.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Guernsey	54·0	43·5	53·0	50·0	54·5	44·5	54·0	50·5	48·0	40·5	42·0	35·0
Helston	53·0	51·0	54·0	45·0	57·0	42·0	50·0	46·0	44·0	32·0	46·0	32·0
Truro	55·0	51·0	55·0	52·0	56·0	48·0	55·0	53·0	40·0	34·0	44·0	34·0
Plymouth	52·5	47·5	54·0	51·0	51·5	45·5	53·0	51·0	48·5	32·5	40·0	31·0
Torquay	52·4	50·2	52·1	46·8	57·5	45·0	53·2	51·0	38·1	33·0	44·2	29·2
Ventnor	51·7	45·3	51·7	49·1	58·8	46·1	52·2	48·3	40·0	34·2	46·7	30·8
Osborne	51·9	44·6	52·0	48·6	59·4	41·2	51·9	47·5	37·0	31·8	43·7	29·0
Bournemouth	50·6	41·6	54·0	45·0	50·8	45·0	51·6	47·2	38·0	33·0	44·2	30·1
Brighton	50·0	40·0	50·2	45·4	51·8	46·8	51·0	44·8	37·0	33·0	38·7	31·0
Salisbury	55·0	43·5	56·5	49·0	58·0	44·0	56·0	49·0	37·0	31·0	44·0	23·0
Barnstaple	55·0	47·0	56·0	53·0	58·0	47·0	56·0	52·0	44·0	32·0	42·0	33·0
Caterham	51·0	44·0	52·0	48·0	55·0	44·0	52·0	26·0	42·0	30·0	45·0	28·0
Bath	—	—	—	—	57·7	45·1	54·0	47·4	36·0	30·0	38·8	27·0
Ramsgate	51·8	41·0	53·0	50·3	53·3	44·4	53·2	48·1	36·1	34·9	38·3	33·6
Strathfield Turgiss	54·0	46·5	54·4	47·5	59·2	47·2	56·0	50·1	38·5	33·4	41·3	29·0
Weybridge Heath	55·0	45·5	55·0	50·5	59·5	41·8	56·0	49·5	36·0	31·5	40·0	29·8
Marlborough	54·7	48·4	54·0	46·2	57·7	46·1	55·5	48·5	35·8	31·1	39·9	26·3
Bristol	54·3	46·2	54·3	51·7	59·0	43·5	56·6	50·5	39·7	31·8	44·0	25·7
Blackheath	57·3	46·0	50·7	49·0	61·2	47·0	56·1	49·1	35·2	31·0	42·3	29·2
Royal Observatory	54·8	43·2	54·8	47·3	60·5	46·4	56·8	50·2	35·8	32·3	40·8	30·8
Streatley	54·0	45·7	56·3	53·0	51·2	47·8	55·2	52·2	42·0	32·0	38·0	27·3
Chiswick	53·0	48·0	56·0	52·0	55·0	42·0	55·5	49·5	43·5	32·5	44·5	31·5
Camden Square	55·6	44·9	54·8	51·0	59·7	46·3	57·2	49·2	38·0	33·4	42·3	31·0
Oxford	54·0	44·9	56·5	52·0	58·1	42·9	58·4	46·9	39·9	33·0	43·0	27·0
Gloucester	54·0	44·5	54·0	49·0	62·0	41·5	55·0	48·0	43·5	34·0	42·7	28·0
Royston	52·0	49·4	54·0	50·0	53·0	44·4	56·2	47·3	41·2	33·6	37·8	30·7
Carlington	56·6	44·0	54·6	51·0	58·0	44·0	59·4	49·0	39·0	31·0	43·4	30·0
Somerleyton	56·2	48·5	45·0	30·8	57·9	41·4	58·2	47·0	34·2	33·0	38·5	31·8
Cambridge	58·0	46·6	54·7	46·0	60·8	47·0	60·8	48·2	39·8	33·7	41·5	29·6
Norwich	56·5	43·0	54·5	44·0	57·5	48·0	58·8	50·0	38·0	33·5	41·0	35·5
Leicester	55·9	49·6	55·4	43·0	59·2	45·9	56·8	49·2	40·2	33·8	43·8	30·5
Wolverhampton	52·4	43·1	54·5	42·7	49·5	40·0	54·5	46·6	35·4	29·5	41·5	23·4
Nottingham	52·3	45·8	55·7	49·9	51·5	43·1	54·5	48·3	37·7	31·0	42·4	29·8
Holkham	52·5	43·0	55·4	40·0	51·2	41·7	54·5	46·4	41·2	34·7	40·6	34·2
Llandudno	57·0	50·8	52·0	41·8	63·4	48·0	54·1	49·2	43·0	33·8	43·5	34·0
Sheffield	50·0	46·5	56·1	41·0	55·0	45·0	59·0	49·0	41·5	31·0	43·0	29·5
Kelstern Grange	54·0	46·1	52·4	39·8	56·3	43·6	56·0	46·2	39·1	33·1	39·2	24·4
Liverpool	55·0	47·1	55·7	41·1	53·8	45·2	56·2	43·9	42·0	30·7	44·5	35·4
Eccles	54·5	44·0	48·4	33·5	60·4	43·7	56·7	44·5	43·8	29·8	47·6	24·8
Bermerside	52·8	49·0	40·2	38·0	59·6	45·0	54·0	40·0	42·0	31·0	44·3	28·0
Hull	56·0	45·0	47·0	42·0	58·0	45·0	59·0	44·0	44·0	34·0	43·0	29·0
Stonyhurst	53·0	37·0	45·0	34·5	57·9	38·0	53·8	42·0	43·2	27·9	40·0	25·0
Bradford	52·8	45·4	53·7	39·8	51·0	45·0	54·0	48·6	38·0	32·0	42·6	30·0
Leeds	57·0	45·0	48·0	39·0	55·0	45·0	60·0	48·0	45·0	30·0	45·0	29·0
Cockermouth	51·2	44·6	53·0	39·0	58·3	46·2	51·9	46·7	43·9	29·3	43·0	34·2
Allenheads	—	35·7	—	29·5	—	—	—	41·8	—	33·0	—	29·8
Silloth	50·7	43·0	50·9	29·9	59·4	45·9	51·4	45·7	44·8	29·5	47·0	27·0
Sunderland	51·0	44·0	42·0	35·0	57·0	47·0	60·0	47·0	45·0	35·0	45·0	29·0
Carlisle	53·5	28·8	44·6	31·5	60·3	41·4	53·8	41·8	43·3	24·0	43·8	26·5
Bywell	49·0	44·0	45·0	35·0	60·0	49·0	58·0	48·0	44·0	32·0	45·0	29·0
North Shields	53·0	43·2	42·0	32·9	55·0	44·8	57·0	43·0	40·4	34·5	40·6	28·6
Waringstown(Ireland)	54·0	28·0	45·0	31·0	57·0	39·0	53·0	42·0	49·0	33·0	47·2	33·0

From the numbers in this table it will be seen how exceptionally warm were January 1st, January 22nd, February 17th, and March 1st, and how exceptionally cold were the days towards the end of March; in fact the minimum temperature of the former were generally higher than the maxima of the latter, whilst on these days the minima generally over the country were near 32°, and at many places were even several degrees lower.

The mean low night temperatures of the air were 1°·8, 3°·2, and 0°·8 respectively above their averages in January, February, and March. Therefore the days and nights were warm on the average throughout the quarter.

The mean daily ranges of temperature were 0°·6, 1°·6, and 1°·1 respectively below their averages in January, February, and March.

At Greenwich the atmospheric pressure in January was greater than in December by 0·116 in., in February greater than in January by 0·122 in., and in March less than in February by 0·211 in. (From the preceding 37 years' observations the mean pressure in January is less than in December by 0·043 in., that in February greater than in January by 0·045 in., and that in March less than in February by 0·057 in.) The mean increase of pressure from December to January over the whole country was pretty nearly the same everywhere, the mean from all stations being 0·125 in. The mean increase from January to February was from all stations 0·105 in.; the mean decrease from February to March was somewhat larger in the midland counties than in the southern or northern parts; the mean from all stations was 0·175 in.

The fall of rain was below its average in each month; the amount in the quarter was 3·0 ins., and back to 1815 there have been only four instances of so small an amount in these 3 months, viz.:—In the year 1820 it was 3·0 ins.; in 1829 it was 2·4 ins.; in 1850 it was 2·8 ins.; and in 1874 it was 2·4 ins.

Thunderstorms occurred on the 23rd of January at Torquay, and on the 24th of March at *Liverpool* and Llandudno.

1878. Months.	Temperature of Air. Mean.	Diff. from average of 107 years.	Diff. from average of 37 years.	Evaporation. Mean.	Diff. from average of 37 years.	Dew Point. Mean.	Diff. from average of 37 years.	Air—Daily Range. Mean.	Diff. from average of 37 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Diff. from average of 37 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Diff. from average of 37 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
Jan. -	40·4	+3·9	+1·7	38·4	+1·2	36·0	+0·8	9·1	−0·6	41·3	0·212	+0·010	2·4	0·0
Feb. -	42·2	+3·5	+2·9	40·5	+2·9	38·5	+3·5	9·7	−1·6	41·7	0·233	+0·027	2·7	+0·3
March -	42·0	+0·9	+0·4	38·5	−0·8	34·3	−3·0	13·5	−1·1	46·5	0·198	−0·018	2·3	−0·2
Means -	41·5	+2·8	+1·7	39·1	+1·1	36·3	+0·8	10·8	−1·1	43·2	0·214	+0·006	2·5	0·0

1878. Months.	Degree of Humidity. Mean.	Diff. from average of 37 years.	Reading of Barometer. Mean.	Diff. from average of 37 years.	Weight of a Cubic Foot of Air. Mean.	Diff. from average of 37 years.	Rain. Amount.	Diff. from average of 63 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
Jan. -	84	−3	29·979	+0·231	556	+ 3	0·9	−1·1	330		8	6	19·5	45·1
Feb. -	87	+3	30·101	+0·308	556	+ 3	1·1	−0·4	219	6	18	4	19·7	45·0
March -	75	−7	29·880	+0·154	552	+ 2	1·1	−0·5	348	16	8	7	13·5	48·0
Means -	82	−2	29·990	+0·231	555	+ 3	Sum 3·1	Sum −2·0	Mean 299	Sum 39	Sum 34	Sum 17	Lowest 13·5	Highest 48·0

NOTE.—In reading this table it will be borne in mind that the plus sign (+) signifies *above* the average, and that the minus sign (−) signifies *below* the average.

The average duration of the different directions of the wind referred to eight points of the compass, and the duration of each direction in each month in the quarter were as follows:—

Direction of Wind.	January. Average.	1878.	Departure from Average.	February. Average.	1878.	Departure from Average.	March. Average.	1878.	Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	1½	4	+2½	2	1	−1	2¾	10	+7¼
N.	3	7	+4	3	4	+1	3¼	5	+1¾
N.E.	3½	2	−1½	3½	2	−1½	4	3	−1
E.	¼	0	− ¼	2	2	0	2½	2	− ½
S.E.	2½	1	−1½	1½	4	+2½	2	0	−2
S.	4½	4	− ½	3	4	+1	2½	1	−1½
S.W.	9½	9	− ½	8	6	−2	7¾	3	−4¾
W.	3½	3	− ½	2¾	4	+1¼	3¾	6	+2¼
Calm (nearly.)	2¼	1	−1¼	2½	1	−1½	2½	1	−1½

The plus sign (+) denotes excesses over averages; the largest numbers affected with this sign in the month of January are opposite to the N.W. and N., in February to the S.E. and W., and in March to the N.W. and W.

The minus sign (−) denotes defects below averages; the largest numbers affected with this sign in the month of January are opposite to the N.E. and S.E., in February to the N.E. and S.W., and in March to the S.E. and S.W.

Thunder was heard but lightning was not seen on the 20th of January at North Shields, and on the 24th and 25th at Hull; on the 26th of February at Strathfield Turgiss; and on the 25th of March at Carlisle.

Lightning was seen but thunder was not heard on the 25th of January at Guernsey, Carlisle, and North Shields, on the 26th at Stonyhurst, and on the 28th at Guernsey; on the 24th of March at Weybridge, Halifax, Hull, and Stonyhurst, on the 27th at North Shields, and on the 29th at Guernsey.

Solar halos were seen on 10 days during the quarter.

Lunar halos were seen on 4 nights in January, 7 nights in February, and 4 nights in March.

Auroræ Borealis was seen, once only, on the 25th of March at Carlisle.

Snow fell on 12 days in January, only 4 days in February, and on 14 days in March.

Hail fell on 31 days during the quarter, 15 days of which were in January, and 13 in March, and only 3 days in February.

Fog prevailed on 17 days during January, and it was pretty general all over the country; in February fog prevailed at one place or other on 21 days out of 28. There was but very little fog in March; it was recorded on the 1st at Helston, on the 5th at Carlisle, on the 20th at Plymouth, and on the 25th at Eccles.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING MARCH 31st, 1878.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the sixth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1878. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat^{n}. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S., F.M.S.	204	Jan.	29·996	1·212	54·0	32·5	21·5	48·2	41·1	7·1	44·5	40·6	·253	2·9	0·5	87	551	—	—	1·6	8	4	7	12	4·5	7·1	14	2·58
		Feb.	30·059	0·863	54·5	31·5	23·0	48·4	40·9	7·5	44·4	42·2	·269	3·1	0·3	92	552	—	—	1·1	6	7	8	7	4·0	7·3	13	2·06
		Mar.	29·906	1·004	54·0	33·0	21·0	49·5	40·9	8·6	44·6	39·6	·244	2·8	0·6	83	549	—	—	1·5	11	5	4	11	5·6	5·3	15	1·37
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	106	Jan.	30·152	1·126	56·0	29·0	27·0	51·2	41·3	9·9	45·9	39·9	·247	2·8	0·8	80	552	54·2	37·3	1·8	10	4	7	10	4·5	6·7	9	2·17
		Feb.	30·160	0·976	57·0	33·0	24·0	51·3	42·4	8·9	46·2	41·5	·263	3·1	0·4	85	552	55·2	39·4	1·6	6	8	8	6	3·8	7·1	10	1·21
		Mar.	30·090	1·024	59·0	28·0	31·0	54·6	38·8	15·8	45·6	40·0	·248	2·8	0·7	82	552	62·4	36·0	2·4	12	5	5	9	6·1	4·5	10	1·77
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	Jan.	30·202	1·092	55·0	24·0	31·0	49·8	39·6	10·2	44·4	41·4	·260	3·0	0·4	89	555	—	—	2·4	12	2	7	10	—	7·6	17	2·63
		Feb.	30·222	0·823	57·0	27·0	30·0	50·1	40·5	9·6	45·0	41·5	·262	3·0	0·4	88	555	—	—	2·0	6	7	8	7	—	8·6	15	1·97
		Mar.	30·130	1·348	59·0	25·0	34·0	52·3	39·6	12·7	45·0	38·5	·235	2·7	0·7	78	553	—	—	2·8	14	3	3	11	—	6·5	12	1·66
PLYMOUTH (Devon), John Merrifield, Esq. F.R.A.S., F.M.S., LL.D.	69	Jan.	30·221	1·362	57·0	27·0	30·0	48·8	38·9	9·9	43·6	41·2	·260	3·0	0·3	91	556	—	37·5	1·2	9	4	7	11	—	7·6	19	2·19
		Feb.	30·266	0·946	54·5	30·5	24·0	49·2	40·1	9·1	44·7	41·5	·261	3·0	0·4	89	556	—	39·1	1·1	6	5	9	8	—	8·3	9	1·25
		Mar.	30·141	1·629	60·0	29·0	31·0	51·5	39·0	12·5	44·4	38·7	·236	2·7	0·6	80	554	—	37·5	1·3	11	5	4	11	—	6·4	11	1·33
BABBACOMBE, Torquay (Devon), Edwin E. Glyde, Esq., F.M.S.	305	Jan.	29·875	1·271	54·8	24·4	30·4	47·2	38·6	8·6	42·8	39·3	·240	2·8	0·4	87	551	80·3	32·5	1·4	9	2	6	14	3·2	6·9	12	1·85
		Feb.	29·937	1·031	57·5	32·2	25·3	48·3	40·4	7·9	44·2	40·2	·256	2·9	0·4	88	550	80·6	34·3	1·1	7	7	5	9	3·8	7·9	12	2·32
		Mar.	29·796	1·617	58·2	26·8	31·4	50·1	38·3	11·8	43·8	37·7	·226	2·6	0·7	78	548	109·8	31·0	1·4	13	3	2	13	3·2	6·3	9	2·13
VENTNOR (Royal National Hospital for Consumption), Isle of Wight, Hartley Sagar, Esq.	100	Jan.	30·103	1·220	57·7	30·9	26·8	48·7	39·3	9·4	43·5	39·4	·242	2·8	0·5	85	554	—	—	—	7	6	4	14	7·0	6·5	15	1·90
		Feb.	30·201	0·836	58·8	30·5	28·3	50·0	40·5	9·5	44·2	41·6	·263	3·0	0·3	91	555	—	—	—	5	9	5	8	7·0	7·9	15	2·15
		Mar.	30·021	1·500	61·4	29·6	31·8	52·4	39·2	13·2	44·2	39·0	·238	2·7	0·6	81	552	—	—	—	12	4	3	12	6·9	7·0	9	2·89
OSBORNE (Isle of Wight), J. R. Mann, Esq.	172	Jan.	29·990	1·212	54·4	24·8	29·6	45·9	35·8	10·1	40·9	38·7	·235	2·7	0·2	92	555	63·8	34·3	0·3	11	1	5	14	—	6·4	10	1·18
		Feb.	30·095	0·870	59·4	27·2	32·2	47·8	38·1	9·7	42·6	41·3	·260	3·0	0·1	95	555	72·5	36·2	0·2	6	5	13	4	—	8·0	13	2·26
		Mar.	29·903	1·476	56·1	25·3	30·8	50·1	36·9	13·2	42·6	38·7	·235	2·7	0·5	86	552	93·6	34·0	0·7	13	2	4	12	—	6·9	8	1·11
SOUTH BOURNE, near Bournemouth, (Hants), T. A. Compton, Esq., M.D., B.A., F.M.S.	128	Jan.	30·037	1·200	54·1	25·0	29·1	46·2	37·6	8·6	41·8	78·4	·234	2·7	0·4	89	556	—	—	—	10	3	4	14	—	5·5	14	1·42
		Feb.	30·164	0·850	54·1	25·0	29·1	48·8	38·4	10·4	43·1	40·9	·256	2·9	0·3	92	556	—	—	—	9	6	5	8	—	6·0	11	1·28
		Mar.	29·990	1·560	57·7	25·0	32·7	49·7	37·1	12·6	43·0	37·3	·223	2·6	0·6	81	553	—	—	—	15	3	2	11	—	4·6	12	1·77
BRIGHTON (Sussex), F. E. Sawyer, Esq., F.M.S.	206	Jan.	29·960	1·310	52·2	26·6	25·6	44·2	35·8	8·4	40·2	36·5	·216	2·5	0·4	87	555	—	32·5	0·8	12	4	4	11	—	6·6	12	1·85
		Feb.	30·091	0·914	51·8	27·0	24·8	45·9	38·7	7·2	42·1	39·7	·244	2·8	0·3	91	555	—	35·7	0·5	6	6	9	7	—	8·0	10	1·96
		Mar.	29·865	1·557	56·5	25·5	31·0	48·0	36·4	11·6	41·8	36·2	·215	2·5	0·6	82	552	—	33·2	1·0	15	4	4	8	—	7·9	11	1·35
SALISBURY (Wilton House), T. Challis, Esq.	186	Jan.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	1·73
		Feb.	30·077	0·912	58·0	21·5	36·5	48·2	34·7	13·5	41·6	39·4	·242	2·8	0·2	93	556	68·8	35·8	1·1	8	4	7	9	—	8·7	18	2·34
		Mar.	29·890	1·476	60·0	23·0	37·0	52·0	33·9	18·1	42·4	38·9	·237	2·7	0·4	87	552	90·5	32·6	1·5	15	2	1	13	—	7·0	13	1·51
BARNSTAPLE (Devon), William Knile, Esq.	43	Jan.	30·169	1·280	56·0	27·0	29·0	46·3	39·5	6·8	43·7	39·6	·244	2·8	0·5	86	555	—	—	1·2	9	2	8	12	—	5·8	19	2·92
		Feb.	30·190	1·039	62·0	28·0	34·0	50·9	40·1	9·9	44·9	41·2	·259	3·0	0·4	87	554	—	—	1·2	4	8	11	5	—	6·6	14	2·23
		Mar.	30·101	1·430	58·0	29·0	29·0	51·5	40·6	10·7	45·2	38·8	·237	2·7	0·7	78	552	—	—	1·3	10	4	5	12	—	5·8	11	1·51
BATH (St. Gregory's College, Downside, Nunnerset). Rev. F. A. Gasquet, O.S.B.	300	Feb.	29·611	0·928	57·7	24·8	32·9	46·2	37·1	9·1	41·4	38·7	·235	2·7	0·3	91	547	—	32·2	1·1	5	5	12	6	—	6·8	11	2·66
		Mar.	29·425	1·098	54·5	25·2	29·3	45·3	34·8	10·5	40·2	35·6	·209	2·4	0·3	84	546	93·1	—	1·6	10	1	6	14	—	6·3	9	2·52

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1878. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean. Of all Highest.	Temperature of Air in Month. Mean. Of all Lowest.	Temperature of Air in Month. Mean. Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a Cubic foot of Air. Mean.	Vapour. In a Cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat.=100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
CATERHAM (Surrey), James Adam, Esq., M.D.	608	Jan.	29·458	1·200	52·0	25·0	27·0	44·3	35·0	9·3	39·5	34·5	·216	2·5	0·3	90	547	—	32·3	4·4	8	3	9	11	0·0	3·7	13	1·57
		Feb.	29·591	0·800	55·0	27·0	28·0	44·3	36·2	8·1	40·9	38·5	·233	2·8	0·2	91	548	—	33·2	4·2	5	3	10	10	0·0	3·5	13	1·67
		Mar.	29·397	1·500	55·0	24·0	31·0	47·3	34·3	13·0	41·3	37·0	·221	2·6	0·5	85	544	—	32·2	4·5	14	8	2	7	0·5	4·1	7	1·06
RAMSGATE (Kent), Rev. E. Douglas O'Gara, O.S.B.	108	Jan.	30·033	1·391	53·0	28·2	24·8	44·5	35·8	8·7	40·4	36·3	·214	2·5	0·5	85	557	67·5	31·8	1·6	5	6	8	12	—	6·9	12	1·90
		Feb.	30·159	0·909	55·3	25·9	29·4	48·4	38·3	10·1	42·6	40·2	·250	2·9	0·3	91	556	76·9	34·2	1·0	6	6	8	8	—	7·6	18	1·20
		Mar.	29·916	1·518	57·2	27·8	29·4	48·3	37·4	10·9	42·1	36·3	·215	2·5	0·6	81	553	89·5	32·0	1·7	7	3	4	17	—	6·3	16	2·12
STRATHFIELD TURGISS (Hants), Rev. C. H. Griffith, M.A., F.M.S.	197	Jan.	29·856	1·256	54·4	22·1	32·3	45·3	35·3	10·0	40·4	36·5	·216	2·5	0·4	87	555	61·8	31·0	0·6	6	4	7	14	0·9	6·4	12	1·09
		Feb.	30·063	0·960	59·2	23·4	35·8	47·6	36·8	10·8	42·0	38·9	·237	2·7	0·4	89	555	74·3	32·1	0·5	5	5	10	8	1·4	8·0	12	1·61
		Mar.	29·880	1·437	59·1	24·0	35·1	51·0	35·6	15·4	42·5	36·6	·209	2·4	0·7	78	552	97·0	30·2	0·7	11	4	3	13	1·2	7·4	8	1·19
WEYBRIDGE HEATH (Surrey), William F. Harrison, Esq., F.M.S.	150	Jan.	30·031	1·334	55·0	23·0	32·0	44·7	35·3	9·0	39·9	35·4	·207	2·4	0·5	84	557	53·7	31·3	0·9	5	3	12	11	0·9	7·0	15	1·08
		Feb.	30·139	0·925	59·5	23·2	36·3	47·2	36·4	10·8	41·9	38·3	·233	2·7	0·4	88	557	61·6	33·1	0·7	4	5	14	5	1·6	8·4	11	1·23
		Mar.	29·927	1·443	60·0	22·8	37·2	50·3	34·5	15·8	41·9	36·3	·216	2·5	0·6	82	553	79·9	30·9	1·2	13	4	6	8	1·0	6·9	9	1·00
MARLBOROUGH, The Green (Wilts), Rev. Thomas A. Preston, M.A., F.M.S.	474	Jan.	29·647	1·280	54·7	25·3	29·4	45·0	35·6	9·4	40·0	37·9	·228	2·6	0·3	93	550	65·3	28·9	0·5	6	2	5	18	—	7·5	16	1·90
		Feb.	29·748	0·925	57·7	24·8	32·9	46·8	37·4	9·4	41·5	39·3	·241	2·8	0·2	93	550	70·7	31·8	0·3	5	4	8	11	—	8·5	13	1·59
		Mar.	29·567	1·442	56·7	24·3	32·4	49·2	34·6	14·6	41·2	36·7	·218	2·5	0·5	84	547	95·1	26·9	0·8	11	2	2	16	—	7·1	11	1·76
BLACKHEATH (London), James Glaisher, Esq., F.R.S.	160	Jan.	29·980	1·320	57·3	25·1	31·2	45·3	35·7	9·6	40·6	36·5	·216	2·5	0·5	86	555	64·1	32·9	0·7	10	2	9	10	—	7·6	11	1·01
		Feb.	30·096	0·925	61·2	25·1	36·1	47·6	37·3	10·3	42·4	38·9	·237	2·7	0·4	88	555	70·8	33·6	0·4	6	5	9	8	—	7·7	11	1·12
		Mar.	29·887	1·465	58·0	25·9	32·1	49·9	36·4	13·5	42·4	36·0	·212	2·5	0·7	79	552	83·9	31·4	1·0	11	4	3	13	—	7·2	9	0·96
STREATLEY VICARAGE (Berks), Rev. J. Slatter, M.A., F.R.S., F.M.S.	150	Jan.	30·003	1·238	56·5	23·3	33·2	46·2	36·9	9·3	41·7	37·9	·228	2·6	0·4	87	554	—	—	1·1	8	4	7	12	—	6·7	16	1·48
		Feb.	30·124	0·863	60·2	23·7	36·5	47·4	37·9	9·5	42·6	40·6	·254	3·0	0·2	93	556	—	—	0·0	4	6	8	10	—	8·5	13	1·57
		Mar.	29·927	1·385	60·2	24·0	36·2	51·5	36·7	14·8	43·5	38·0	·229	2·6	0·6	82	551	—	—	1·9	13	5	3	10	—	7·1	10	0·85
CHISWICK (Middlesex), Thomas R. Sim.	25	Jan.	30·058	1·280	56·0	23·0	33·0	46·6	35·0	11·6	40·8	37·9	·228	2·8	0·3	90	557	64·0	30·0	1·0	8	5	4	14	—	7·8	9	1·04
		Feb.	30·212	0·826	56·0	24·0	32·0	48·1	35·8	12·3	42·2	38·9	·237	2·7	0·4	89	558	69·3	—	0·6	4	6	8	10	—	8·7	8	1·26
		Mar.	30·012	1·600	59·0	22·0	37·0	51·1	34·6	16·5	42·4	37·1	·221	2·6	0·6	86	556	89·5	31·7	1·2	7	4	3	17	—	7·7	5	1·01
CAMDEN SQUARE (London), G. J. Symons, Esq., F.M.S.	123	Jan.	30·018	1·348	55·6	26·9	28·7	45·2	35·5	9·7	40·5	37·1	·220	2·5	0·4	88	556	59·9	32·1	—	13	3	5	10	—	7·1	15	1·31
		Feb.	30·132	1·000	59·7	25·7	34·0	47·7	37·7	10·0	42·7	39·0	·237	2·7	0·4	86	556	64·2	34·1	—	7	4	8	9	—	8·0	11	1·49
		Mar.	29·923	1·468	58·0	26·4	31·6	51·0	36·3	14·7	42·9	36·3	·214	2·5	0·7	78	552	86·2	31·8	—	14	2	1	14	—	7·0	10	1·12
OXFORD OBSERVATORY, Rev. R. Main, M.A., F.R.S., F.R.A.S.	210	Jan.	29·929	1·202	56·4	25·1	31·3	45·5	36·7	8·8	41·2	37·8	·228	2·6	0·4	88	554	—	33·6	0·7	7	4	6	14	1·6	8·1	21	1·52
		Feb.	30·019	0·938	57·9	25·1	32·8	47·3	39·1	8·2	43·0	39·7	·245	2·8	0·4	88	553	—	35·8	0·3	5	5	10	8	0·6	8·6	17	1·35
		Mar.	29·840	1·472	58·1	26·0	32·1	49·0	36·0	13·0	42·5	35·1	·206	2·4	0·6	76	551	93·5	32·0	0·7	12	3	3	13	2·4	7·9	10	0·78
GLOUCESTER ASYLUM, E. Toller, Esq., M.D.	100	Jan.	30·058	1·200	54·5	21·0	33·5	47·2	34·4	12·8	41·2	39·4	·243	2·8	0·2	93	556	62·9	—	0·4	8	5	4	14	0·5	7·6	16	1·06
		Feb.	30·150	0·948	62·0	20·5	41·5	49·1	34·9	14·2	42·0	40·2	·249	2·9	0·2	93	557	85·2	—	0·3	5	4	7	12	0·1	8·3	10	1·62
		Mar.	30·053	1·388	61·5	20·0	41·5	51·3	33·2	18·1	41·9	36·7	·219	2·5	0·6	83	555	97·3	—	0·6	12	7	4	8	1·2	7·1	9	0·84
ROYSTON (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	Jan.	29·852	1·240	56·0	24·1	31·9	44·9	33·7	11·2	39·3	36·1	·213	2·5	0·3	89	554	—	—	—	8	3	8	12	—	7·4	15	1·66
		Feb.	29·983	0·954	58·6	25·7	32·9	47·5	35·3	12·2	41·8	38·2	·229	2·7	0·4	87	554	—	—	—	4	2	11	11	—	7·8	13	1·11
		Mar.	29·775	1·417	58·7	22·6	36·1	49·9	33·9	16·0	41·2	34·7	·201	2·3	0·7	78	551	—	—	—	12	3	3	13	—	7·1	9	1·03
CARDINGTON (near Bedford), Mr. J. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	105	Jan.	30·029	1·290	56·6	24·0	32·6	44·6	33·8	10·8	39·4	36·2	·214	2·5	0·4	89	558	47·7	30·2	1·1	10	1	5	15	—	6·9	13	1·20
		Feb.	30·147	0·850	58·6	26·0	32·6	47·7	36·1	11·6	41·8	39·4	·242	2·9	0·2	92	557	57·4	32·1	0·3	2	2	10	14	—	8·1	9	1·35
		Mar.	29·942	1·400	59·4	23·6	35·8	49·7	35·2	14·5	41·8	35·5	·193	2·2	0·8	74	553	74·2	29·7	1·9	16	3	1	11	—	6·6	9	0·48
CAMBRIDGE (Trinity College), J. W. L. Glaisher, Esq., M.A., F.R.S.	40	Jan.	30·065	1·300	58·0	21·2	36·8	45·1	35·6	9·5	40·3	37·3	·223	2·6	0·4	90	557	70·0	30·0	1·2	8	3	9	11	—	7·1	19	1·33
		Feb.	30·200	0·816	60·8	27·5	33·3	48·7	37·6	11·1	42·8	38·8	·236	2·7	0·5	86	558	76·5	31·6	0·8	4	3	11	10	—	7·2	15	1·09
		Mar.	29·983	1·418	60·8	24·3	36·5	50·4	35·7	14·7	42·2	35·7	·210	2·4	0·7	79	554	102·0	31·0	1·4	11	3	3	14	—	6·8	16	0·94

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1878. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Highest.	Temperature of Air in Month. Mean Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat^{n}. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Steward, F.M.S.	50	Jan.	30·070	1·390	56·2	20·8	35·4	44·3	33·3	11·0	39·0	33·1	·230	2·7	0·2	96	559	—	—	1·0	7	5	7	12	7·1	6·7	22	1·68
		Feb.	30·216	0·770	50·7	28·0	31·7	48·5	36·2	12·3	42·9	41·6	·263	3·0	0·1	98	558	—	—	0·9	5	3	9	11	7·3	7·8	11	1·15
		Mar.	29·947	1·502	58·7	23·0	35·7	49·4	35·0	14·4	41·7	38·3	·231	2·7	0·4	89	553	—	—	1·2	11	5	3	12	8·4	6·5	19	1·67
NORWICH (Norfolk), John Quinton, Esq., Jun.	42	Jan.	30·056	1·398	56·5	27·0	29·5	44·3	36·2	8·1	40·0	38·6	·234	2·7	0·2	95	557	—	—	—	6	2	6	17	—	—	16	1·69
		Feb.	30·205	0·926	57·5	28·0	29·5	47·3	38·6	8·7	42·5	40·3	·250	2·9	0·2	92	557	—	—	—	4	2	12	10	—	—	7	0·90
		Mar.	29·952	1·486	58·8	28·2	30·6	48·5	37·1	11·4	41·8	38·2	·231	2·7	0·4	88	554	—	—	—	8	1	4	18	—	—	16	0·65
WROTTESLEY, WOLVERHAMPTON (Stafford), E. Simpson, Esq.	500	Jan.	—	—	54·5	20·8	33·7	44·6	34·4	10·2	39·5	36·5	·216	2·5	0·3	90	—	—	—	—	8	3	7	13	—	8·5	16	1·96
		Feb.	—	—	52·7	24·0	28·7	44·4	34·5	9·9	39·4	37·8	·228	2·7	0·2	94	—	—	—	—	5	4	12	7	—	9·3	12	1·05
		Mar.	29·517	1·262	56·5	22·9	33·6	47·5	34·6	12·9	40·2	35·2	·205	2·4	0·5	83	547	—	—	—	13	3	4	11	—	7·8	10	0·70
LEICESTER (Town Museum), W. J. Harrison, Esq., F.G.S.	245	Jan.	29·831	1·210	55·9	26·0	29·9	44·7	36·3	8·4	40·6	36·5	·216	2·5	0·5	86	553	60·8	29·7	1·2	9	3	7	12	—	7·1	20	1·59
		Feb.	29·984	0·578	59·2	25·5	33·7	47·0	37·2	9·8	41·7	37·6	·228	2·6	0·5	87	554	62·7	30·1	0·5	4	4	12	8	—	7·2	13	1·24
		Mar.	29·780	1·463	56·8	26·0	30·8	48·2	36·2	12·0	41·8	35·2	·208	2·4	0·7	79	551	80·0	28·4	1·0	12	3	5	11	—	7·2	13	0·77
NOTTINGHAM (Notts), M.O. Talbotton, Esq., C.E., F.G.S., F.M.S.	183	Jan.	29·904	1·226	55·7	25·1	30·6	45·2	34·9	10·3	40·6	37·7	·226	2·6	0·3	92	554	57·9	32·2	0·3	8	3	6	14	1·6	7·1	23	2·00
		Feb.	30·034	0·764	59·8	22·0	37·8	47·5	35·4	12·1	41·0	38·7	·235	2·7	0·3	92	556	66·1	33·0	0·3	4	5	11	8	1·5	7·8	18	0·98
		Mar.	29·857	1·232	59·4	22·0	37·4	50·0	35·0	15·0	41·8	37·3	·225	2·6	0·5	86	552	85·3	32·4	0·5	15	2	2	12	2·0	6·2	13	0·59
HOLKHAM (Norfolk), John Davidson, Esq., Assistant to the Earl of Leicester.	39	Jan.	30·027	1·368	55·4	29·2	35·2	44·0	33·1	10·9	39·0	35·8	·210	2·4	0·4	89	558	59·2	27·2	1·6	7	2	10	12	—	7·0	19	1·43
		Feb.	30·178	0·774	59·2	23·9	35·3	46·0	35·3	10·7	41·0	38·7	·235	2·7	0·3	92	558	78·9	29·2	1·2	2	2	12	12	—	7·4	9	1·00
		Mar.	29·940	1·452	58·0	20·8	37·2	48·6	35·1	13·5	41·5	35·0	·204	2·4	0·7	78	554	90·8	28·8	2·2	11	2	5	13	—	6·9	11	0·99
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	Jan.	30·015	1·170	57·9	28·0	29·9	47·5	39·6	7·9	43·6	38·4	·232	2·7	0·5	81	553	—	—	1·0	6	3	5	17	—	7·1	18	2·71
		Feb.	30·084	0·980	63·4	29·5	34·1	49·1	39·8	9·3	44·2	41·6	·263	3·0	0·3	91	553	—	—	0·5	4	4	8	12	—	7·3	11	1·13
		Mar.	29·967	1·450	55·2	31·4	23·8	49·1	39·6	9·5	44·0	37·5	·224	2·6	0·7	77	551	—	—	1·0	11	5	1	14	—	7·1	15	1·85
KELSTERN GRANGE, near Louth (Lincolnshire), D. Grant Briggs, Esq., F.M.S.	393	Jan.	29·654	1·226	55·9	22·8	31·1	42·0	33·8	8·2	37·6	36·2	·213	2·5	0·1	94	552	67·9	29·8	1·0	8	3	6	14	6·5	6·4	24	2·38
		Feb.	29·786	0·956	56·1	27·1	29·0	45·8	35·3	10·5	40·0	37·9	·228	2·7	0·3	93	552	73·9	31·6	0·8	4	2	11	11	6·5	6·3	16	1·69
		Mar.	29·580	1·491	57·0	25·9	31·1	47·4	34·1	13·3	39·9	37·4	·224	2·6	0·3	91	549	98·4	30·2	1·1	11	3	2	15	7·8	6·3	18	1·54
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	Jan.	29·889	1·260	55·7	27·6	28·7	45·5	37·8	7·7	41·3	38·3	·232	2·7	0·4	90	553	—	—	1·4	7	3	7	14	—	7·2	20	2·82
		Feb.	29·989	1·002	61·9	28·2	33·7	46·2	38·2	8·0	41·8	38·2	·231	2·7	0·4	88	554	—	—	0·2	3	8	8	9	—	8·1	13	0·59
		Mar.	29·843	1·456	56·2	30·0	26·2	47·1	38·8	8·3	42·0	36·2	·214	2·4	0·8	81	551	—	—	1·4	8	4	3	16	—	7·0	14	1·64
ECCLES (near Manchester), T. Mackereth, Esq., F.M.S., F.R.A.S.	145	Jan.	29·949	1·240	55·4	19·3	36·1	44·5	33·7	10·8	39·6	36·2	·214	2·5	0·4	88	556	45·6	27·5	0·5	10	4	4	13	2·2	7·9	21	3·36
		Feb.	30·058	0·990	60·4	22·1	38·3	46·2	34·2	12·0	40·7	36·9	·219	2·5	0·4	86	557	50·1	28·3	0·1	4	4	11	9	1·3	7·1	13	1·44
		Mar.	29·894	1·472	56·7	24·9	33·8	48·6	33·4	15·2	41·0	35·8	·210	2·4	0·6	82	553	57·9	27·0	0·6	14	3	3	11	2·9	6·9	14	1·37
BERMERSIDE OBSERVATORY, HALIFAX (Yorkshire), E. J. Crossley, Esq., F.R.A.S.	520	Jan.	29·522	1·567	52·8	28·3	24·5	42·4	35·3	7·1	38·6	33·4	·192	2·2	0·5	88	549	61·3	31·5	0·6	6	4	7	14	—	7·5	18	4·05
		Feb.	29·643	0·910	59·6	28·5	31·1	45·7	36·8	8·9	40·6	37·9	·228	2·7	0·3	95	549	65·4	32·4	0·4	2	4	9	15	—	8·0	9	1·23
		Mar.	29·472	1·370	59·0	27·0	32·0	47·2	34·7	12·5	39·9	36·1	·212	2·5	0·4	86	547	81·3	31·3	0·8	8	3	6	14	—	6·8	9	2·02
HULL (Yorkshire), Mr. E. Peake.	12	Jan.	30·045	1·234	56·0	23·0	33·0	43·0	34·7	8·3	39·5	35·4	·209	2·4	0·4	86	558	51·1	32·7	—	—	—	—	—	2·9	—	18	2·60
		Feb.	30·189	0·990	58·0	27·0	31·0	47·1	36·2	10·9	41·8	37·1	·223	2·6	0·5	85	558	57·3	34·6	—	—	—	—	—	0·6	—	10	1·28
		Mar.	29·982	1·200	59·0	26·0	33·0	49·0	35·3	13·7	41·7	35·7	·209	2·4	0·6	80	554	78·7	35·8	—	—	—	—	—	3·8	—	14	1·30
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.S., F.M.S., F.R.A.S.	363	Jan.	29·688	1·236	53·3	23·0	30·3	44·5	34·2	10·3	39·5	36·5	·217	2·5	0·3	90	551	64·3	31·4	1·6	4	1	8	18	—	7·4	21	5·09
		Feb.	29·790	0·996	57·9	27·2	30·7	46·4	34·6	11·8	40·5	37·6	·225	2·6	0·3	90	552	68·5	32·8	1·0	3	2	13	10	—	8·4	20	2·11
		Mar.	29·637	1·505	57·1	22·1	35·0	47·5	32·3	15·2	40·1	35·1	·204	2·4	0·5	83	550	101·6	30·4	2·0	6	3	3	19	—	7·3	13	2·68
LEEDS (Philosophical Hall) (Yorkshire), H. Crowther, Esq.	137	Jan.	29·932	1·240	57·0	25·0	32·0	44·8	35·6	9·2	41·0	34·9	·202	2·4	0·6	79	554	50·0	—	1·5	7	4	5	15	—	4·6	17	2·50
		Feb.	30·069	0·941	57·0	29·0	28·0	48·3	37·3	11·0	43·0	36·1	·213	2·5	0·7	77	555	52·0	—	1·3	5	4	5	14	—	5·0	8	1·08
		Mar.	29·870	1·352	60·0	25·0	35·0	50·5	35·5	15·0	42·7	33·4	·192	2·2	0·9	71	551	65·1	—	1·7	8	4	4	15	—	4·5	9	0·52
BRADFORD (Yorkshire), J. McLandsborough, Esq., C.E., F.G.S.	366	Jan.	29·693	1·220	53·7	25·6	28·7	43·9	36·6	7·3	40·2	36·5	·216	2·5	0·4	87	551	50·0	—	1·0	9	3	7	12	—	7·5	20	3·54
		Feb.	29·810	0·940	56·6	28·4	30·2	45·2	37·6	7·6	41·4	36·7	·216	2·5	0·5	84	551	53·4	—	1·0	7	2	9	10	—	8·3	8	1·07
		Mar.	29·645	1·316	56·6	28·9	29·7	48·1	36·7	11·4	41·7	35·4	·200	2·4	0·7	79	548	65·4	—	1·3	12	1	2	16	—	6·9	14	1·16

Names of Stations and Observers.	Elevation of Station above Sea Level.	Year 187[illegible]	Pressure of Atmosphere in Month.		Temperature of Air in Month.						Mean Temperature.		Vapour.			Mean Degree of Humidity. Sat. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer		Wind.					Mean Amount of Ozone.	Mean Amount of Cloud.	Rain.	
			Mean.	Range.	Mean.	Highest.	Lowest.	Range.	Daily Range.		Air.	Dew Point.	Mean.	In a Cubic foot of Air.	Elastic Force.			Maximum in Sun.	Minimum on Grass.	Estimated Strength.	Relative Proportion of N.	N.E.	E.	S.E.	S.			Amount fallen.	Number of Days it fell.
	feet		in.	in.	°	°	°	°	°		°	°	grs.		in.		grs.	°	°								in.	

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days on which it fell.	Rain. Amounts collected.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
Guernsey	29·958	54·5	31·5	23·0	48·7	41·0	21·8	7·7	44·5	40·8	·255	2·9	0·5	87	551	—	—	1·4	8	5	6	10	4·7	6·6	42	6·1
Helston	29·998	59·0	28·0	41·0	52·4	40·8	27·8	11·6	45·9	40·5	·253	2·9	0·6	82	552	57·3	37·2	1·9	9	6	7	8	4·8	6·1	29	5·1
Truro	29·980	59·0	24·0	35·0	50·7	39·9	31·7	10·8	44·8	40·5	·252	2·9	0·5	85	554	—	—	2·4	11	4	6	9	—	7·6	44	6·1
Plymouth	30·034	60·0	27·0	33·0	49·8	39·3	28·3	10·5	44·2	40·5	·252	2·9	0·4	87	555	—	38·0	1·2	9	5	7	10	—	7·4	39	4·7
Torquay	29·986	58·2	24·4	33·8	48·5	39·1	29·0	9·4	43·6	39·3	·241	2·8	0·5	84	550	9·2	32·6	1·5	10	4	4	12	3·4	7·0	33	6·1
Ventnor	29·971	61·4	29·6	31·8	50·4	39·7	29·0	10·7	44·0	40·0	·248	2·8	—	—	554	—	8	6	4	11	7·0	7·1	39	6·4
Osborne	29·944	59·4	24·8	34·6	47·9	36·9	30·9	11·0	42·0	39·6	·243	2·8	0·3	91	554	74·6	34·8	0·4	10	3	7	10	—	7·1	31	4·7
Bournemouth	29·978	57·7	25·0	32·7	48·2	37·7	30·3	10·5	42·6	38·9	·238	2·7	0·4	87	555	—	—	—	11	4	4	11	—	5·4	37	4·4
Brighton	29·970	56·6	25·5	31·1	46·0	37·0	27·2	9·0	41·4	37·5	·225	2·6	0·4	87	554	—	33·8	0·8	11	5	6	9	—	7·5	33	5·1
Salisbury	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	43	5·2
Barnstaple	29·950	52·0	27·0	25·0	49·9	40·1	30·7	9·8	44·6	39·9	·247	2·8	0·5	84	554	—	—	1·2	8	5	8	10	—	6·1	44	6·1
Caterham	29·999	55·6	24·0	31·1	45·3	35·2	28·7	10·1	40·6	37·3	·223	2·6	0·3	89	540	—	32·6	4·4	9	5	7	9	0·2	3·8	33	4·1
Ramsgate	29·930	57·2	25·9	31·5	47·1	37·2	27·9	9·9	41·7	37·6	·226	2·6	0·5	83	555	77·8	32·7	1·4	6	5	7	12	—	6·9	46	5·1
Strathfield Turgiss	29·995	59·2	22·1	37·1	48·0	35·9	31·4	12·1	41·6	37·0	·211	2·5	0·5	85	554	77·7	31·1	0·6	7	4	7	12	1·2	7·3	32	5·1
Weybridge Heath	29·981	60·0	22·8	37·2	47·3	35·4	25·2	11·9	41·2	36·7	·219	2·5	0·5	85	556	65·1	31·8	0·9	7	4	11	8	1·2	7·4	35	5·1
Marlborough Green	29·935	57·7	24·3	33·4	47·0	35·9	31·6	11·1	40·9	38·0	·229	2·6	0·3	90	549	77·0	29·2	0·5	7	5	5	15	—	7·7	40	5·1
Blackheath	29·944	61·2	25·1	36·1	47·6	36·5	33·1	11·1	41·8	37·1	·222	2·6	0·5	84	554	72·9	32·6	0·7	9	4	7	10	—	7·3	31	3·6
Streatley Vicarage	29·949	60·2	23·5	36·7	49·4	37·2	35·5	11·2	42·6	38·8	·237	2·7	0·4	87	554	—	—	1·3	8	5	6	11	—	7·4	39	3·9
Chiswick	29·892	59·0	22·0	37·0	48·6	35·1	34·0	13·5	41·8	38·0	·229	2·7	0·4	88	557	74·3	—	0·7	6	5	5	14	—	8·1	22	3·2
Camden Square	29·937	59·7	25·7	34·0	48·0	36·5	31·4	11·5	42·0	37·5	·224	2·6	0·5	84	555	70·1	32·7	—	11	3	5	11	—	7·4	36	3·9
Oxford	29·937	58·1	25·1	33·0	47·3	37·3	32·1	10·0	42·2	37·5	·226	2·6	0·5	84	553	—	33·8	0·6	8	4	6	12	1·5	8·2	48	5·6
Gloucester	29·962	62·0	20·0	42·0	49·2	34·2	38·8	15·0	41·7	38·8	·237	2·7	0·3	90	556	81·8	—	0·4	8	5	5	11	0·6	7·7	35	3·2
Royston	29·957	58·7	22·6	36·1	47·4	34·3	33·6	13·1	40·8	36·3	·214	2·5	0·5	85	553	—	—	—	8	3	7	12	—	7·3	37	3·9
Cardington	29·935	59·4	23·6	35·8	47·3	35·0	32·7	12·3	40·7	36·4	·216	2·5	0·5	85	556	59·8	30·7	1·2	9	2	5	13	—	7·2	31	3·0
Cambridge	29·897	60·8	21·2	39·6	48·1	36·4	35·5	11·7	41·8	37·3	·223	2·6	0·5	85	556	82·8	30·9	1·1	8	3	8	12	—	7·0	30	3·3
Somerleyton	29·893	59·7	20·8	38·9	47·4	34·8	34·3	12·6	41·2	39·3	·241	2·8	0·2	94	557	—	—	1·0	8	4	6	12	7·6	7·0	52	4·3
Norwich	29·880	58·8	27·0	31·8	46·7	37·3	29·9	9·4	41·4	39·0	·238	2·8	0·3	92	556	—	—	—	6	2	7	15	—	—	39	3·2
Wolverhampton	—	56·5	29·8	35·7	45·5	34·5	32·0	11·0	39·7	36·5	·216	2·5	0·3	89	—	—	—	—	9	3	8	10	—	8·5	35	3·7
Leicester	29·920	59·2	25·3	33·7	46·6	36·6	31·3	10·0	41·4	36·4	·217	2·5	0·6	84	553	70·8	29·4	0·9	8	3	8	10	—	7·2	46	3·8
Nottingham	29·907	59·8	22·0	37·8	47·6	35·1	35·3	12·5	40·9	37·9	·229	2·6	0·4	90	554	69·8	32·5	0·4	9	3	6	11	1·7	7·0	49	3·5
Holkham	29·874	59·2	20·2	39·0	46·2	34·6	35·9	11·6	40·3	36·5	·216	2·5	0·5	86	557	76·6	28·4	1·7	7	2	9	12	—	7·1	39	3·3
Llandudno	29·894	63·4	28·0	35·4	48·6	39·7	29·3	8·9	43·9	39·2	·240	2·8	0·5	85	552	—	—	0·8	7	4	5	14	—	7·2	44	3·8
Kelstern Grange	29·883	57·0	22·8	34·2	45·1	34·4	30·4	10·7	39·2	37·2	·222	2·6	0·2	93	551	89·1	30·5	1·0	8	3	6	13	6·9	6·3	58	3·6
Liverpool	29·902	61·9	27·0	34·9	46·3	38·3	29·5	8·0	41·7	37·6	·226	2·6	0·5	86	553	—	—	1·2	6	5	6	13	—	7·4	47	3·9
Eccles	29·914	60·4	19·3	41·1	46·4	33·8	36·1	12·6	40·3	36·3	·214	2·5	0·5	86	555	51·2	27·6	0·4	9	4	6	11	2·1	7·3	48	6·3
Bermerside, Halifax	29·916	59·6	27·0	32·6	45·1	35·6	29·2	9·5	39·7	35·8	·211	2·5	0·4	88	548	69·3	31·7	0·6	5	4	7	14	—	7·4	36	7·3
Hull	29·871	59·0	23·0	36·0	46·4	35·4	32·3	11·0	41·0	34·1	·214	2·5	0·5	84	557	60·7	33·7	—	—	—	—	—	2·4	—	42	5·1
Stonyhurst	29·899	57·9	22·1	35·8	46·1	33·7	32·0	12·4	40·0	36·4	·215	2·5	0·4	88	551	78·1	31·5	1·5	4	2	8	16	—	7·7	34	9·8
Leeds	29·908	60·0	25·0	35·0	47·9	36·1	31·7	11·8	42·2	34·8	·202	2·4	0·7	76	553	55·7	—	1·5	7	4	5	15	—	4·7	34	4·2
Bradford	29·911	58·6	25·0	33·6	45·7	37·0	29·5	8·7	41·1	36·2	·213	2·5	0·5	83	553	55·6	—	1·1	9	2	6	13	—	7·6	42	5·7
Cockermouth	29·858	58·4	22·8	35·6	45·9	36·3	32·4	9·6	40·8	36·8	·219	2·5	0·4	86	554	63·6	28·8	0·4	8	6	8	9	3·4	7·1	51	9·1
Allenheads	—	—	15·5	—	—	30·4	—	—	—	—	—	—	—	—	—	67·7	—	1·0	—	—	—	—	—	6·5	44	9·1
Silloth	29·850	64·3	22·7	41·6	47·8	35·9	33·6	11·9	41·3	37·2	·222	2·6	0·5	84	556	68·2	32·0	1·3	6	4	5	15	8·7	5·7	40	7·7
Carlisle	29·834	58·3	22·7	35·6	46·5	34·4	31·8	12·1	40·1	36·0	·213	2·4	0·5	86	556	64·6	29·6	1·7	6	4	7	13	5·8	7·1	46	6·9
Bywell	29·820	60·0	24·0	36·0	47·9	36·9	29·3	11·0	41·3	35·4	·207	2·4	0·6	80	554	58·9	30·8	1·4	8	4	4	14	—	5·7	47	6·5
North Shields	—	57·0	23·0	34·0	45·5	35·6	28·5	9·9	40·1	36·0	·213	2·4	0·4	84	556	—	34·4	1·7	10	4	3	13	—	6·6	55	3·1
Waringstown (Irel.)	29·819	57·0	24·0	33·0	48·3	35·9	29·3	12·4	41·7	38·8	·237	2·7	0·3	90	551	68·7	33·0	2·6	5	3	8	14	—	8·2	39	7·3

The highest temperatures of the air were at Silloth, 64°·3; Llandudno, 63°·4; and Barnstaple and Gloucester, both 62°·0.
The lowest temperatures of the air were at Allenheads, 15°·5; Eccles, 19°·3; Gloucester, 20°·0; and Holkham, 20°·2.
The greatest daily ranges of the temperatures of the air were at Gloucester, 15°·0; Chiswick, 13°·5; and Royston, 13°·1.
The least daily ranges of the temperatures of the air were at Guernsey, 7°·7; Liverpool, 8°·0; and Bradford, 8°·7.
The greatest number of rainy days were at Waringstown, 59; Kelstern Grange, 58; and North Shields, 55.
The least number of rainy days were at Chiswick, 22; Helston, 29; and Osborne, Blackheath, and Cardington, all 31.
The heaviest falls of rain were at Stonyhurst, 9·88 inches; Allenheads, 9·78 inches; and Cockermouth, 9·12 inches.
The least falls of rain were at Cardington, 3·03 inches; Blackheath, 3·09 inches; and Norwich, 3·24 inches.

Quarterly Meteorological Table for different Parallels of Latitude.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Mean Number of Days it fell.	Rain. Mean Amount collected.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
Guernsey	29·958	54·5	31·5	23·0	48·7	41·0	21·8	7·7	44·5	40·8	·255	2·9	0·5	87	551	—	—	1·4	8	5	6	10	4·7	6·6	42	6·1
50° and 51°	29·980	58·9	26·0	32·9	49·2	38·8	29·2	10·4	43·6	39·6	·244	2·8	0·5	86	553	74·7	35·3	1·3	10	5	6	10	5·1	6·9	38	5·2
between 51° and 52°	29·949	59·3	23·9	35·4	47·8	36·4	32·8	11·4	41·9	37·9	·228	2·6	0·4	86	554	74·6	32·1	1·1	8	4	7	11	0·9	7·1	37	4·4
the 52° and 53°	29·908	59·1	22·6	36·5	47·0	35·4	33·5	11·6	40·9	37·3	·223	2·6	0·5	88	555	71·9	30·4	1·0	8	3	7	12	4·7	7·3	42	3·9
atitudes 53° and 54°	29·900	59·8	24·4	35·4	46·4	36·0	31·1	10·4	41·0	36·6	·217	2·5	0·5	85	553	64·4	31·0	1·0	7	4	6	13	3·8	6·9	45	6·1
54° and 55°	29·848	60·2	23·0	37·2	47·0	35·9	31·8	11·1	40·9	36·4	·215	2·5	0·5	85	553	64·6	30·8	1·2	7	4	6	13	6·0	6·4	46	7·1
Mean for the Year 1875	29·802	57·7	17·3	40·4	45·4	35·1	31·7	10·3	39·8	36·4	·217	2·5	0·4	87	553	65·7	31·1	1·4	7	8	7	8	3·9	7·4	46	6·1
Quarter, " 1876	29·631	58·1	19·2	38·9	45·5	34·3	33·6	11·2	39·6	36·0	·212	2·5	0·4	87	551	66·3	30·7	1·4	6	6	8	10	4·2	6·7	53	8·1
50° to 55° " 1877	29·566	58·0	21·7	36·3	46·3	36·7	31·3	11·6	41·4	38·3	·233	2·7	0·5	86	547	70·0	31·6	1·3	6	3	8	13	4·9	6·7	63	10·1
" 1878	29·917	59·5	24·0	35·5	47·5	36·5	31·7	11·0	41·7	37·6	·226	2·6	0·5	86	554	70·0	31·8	1·1	8	4	6	12	4·1	6·9	41	5·1

METEOROLOGY OF ENGLAND,
DURING THE QUARTER ENDING JUNE 30, 1878.

REMARKS ON THE WEATHER DURING THE QUARTER ENDING JUNE 30TH, 1878.

By JAMES GLAISHER, ESQ., F.R.S., *&c.*

THE cold and ungenial weather with which the preceding quarter closed continued for several ys into April, till the 7th day severe frosts were experienced every night, and the average daily ficiency of mean temperature was $2\frac{3}{4}°$. On the 10th day rain fell at many places, and continued r several hours on the 11th. On these days the rainfall in the London District was very markable; at Caterham the fall in the two days was 1·6 ins.; at Croydon 2·2 ins.; at Black-ath 2 ins. nearly; at Greenwich Observatory 2·8 ins.; north of London, at Camden Square, here the fall was the heaviest, 3·23 ins.; at Muswell Hill 2·8 ins.; at Chiswick 2·3 ins.; and r. G. J. Symons states that $2\frac{1}{2}$ ins. out of the 3·23 ins. fell in 12 hours. This unusual fall of rain used very heavy floods at low lying places south of the Thames, and very serious injury to operty in many localities, particularly at Lewisham, Lee, and Peckham.

On the 12th the weather became warm, and from this day till May 19th, the mean temperature every day was above its average, the mean excess of these 39 days was 4°·9 daily. On some these days the excess of temperature was as large as 7° or 8°, the sky was, however, nearly ways overcast, and rain fell frequently; in May rain fell on nearly every day from the 6th; there ere many heavy rain-falls between May 6th and May 11th, the heaviest was at Bath, viz., 2 ins. the 10th, causing serious floods in the City. On the same day rain exceeding an inch fell at ilton and Wrottesley; on the 11th the fall was 1·8 ins. at Gloucester; and nearly 0·9 in. at arlborough, and moderately heavy falls on this day occurred in Cornwall and Devonshire. On e 7th there was nearly an inch at Ramsgate; an inch or more at Royston, Cardington, Cambridge, merleyton, and more than half an inch at many places. On the 8th more than an inch fell at icester; and on the 9th the fall exceeded half an inch at many places. At Greenwich on the h the fall was 1·6 ins., of which one inch fell between 6h. p.m. and 6h. 50m. p.m. On the 20th May the weather again set in cold, and on nearly every day the mean temperature was below average till June 19th, the average deficiency of these 31 days was $2\frac{1}{3}°$ daily; from June 20th the end of the month the temperature was in excess of its average, particularly from the 23rd to e 29th, when the weather was hot, the temperature at some places reaching to 90° or higher; e average daily excess of temperature of these 11 days was 7°.

On June 23rd a second almost unprecedented local fall of rain occurred in the London district, t it was chiefly confined to the north of London. At Camden Square Mr. Symons measured 28 ins. of rain, as falling between 1h. 32m. p.m. and 3h. 2m. p.m., and he remarks that no n fell between 2h. 12m. and 2h. 46m., so that this large amount of rain actually fell in 56 nutes; the area over which this heavy rain fell was small, there was no rain at Kew, at Black-ath the fall was 0·58 in., and at most places within a few miles of London, the fall was a few ths of an inch only. This heavy fall of rain caused the streets in the north of London to be running rivers, and very much damage was done, a main drain near Camden Square burst, d water rushed towards King's Cross in large volumes, and from thence into the main tunnel the Metropolitan Railway, and the traffic near Farringdon Street was stopped for two or ree days.

During the rain of June 23rd, there was a severe thunderstorm, the lightning was very vivid d frequent, and many places about Hackney, Tottenham, and Kentish Town were struck by htning; on the same day there was another severe storm near Croydon, and several places re struck by lightning. The quarter has been remarkable for a deficiency of sunshine, and r almost continuous rain in May. In the quarter the fall of rain at Greenwich was 13·2 ins., ing more than twice the average fall for these three months, and more than one half of the mean nual fall of rain. The fall exceeded its average by 7·6 ins. There is no instance of so heavy a l in these three months back to the year 1815, the nearest approach was in the year 1860, when e fall amounted to 10·7 ins., being $2\frac{1}{3}$ ins. less than in this year.

The readings of the barometer in the vicinity of London were below their averages from the t to the 5th of April, above from the 6th to the 15th, below from the 16th to the 25th, above on e 26th, 27th, and 28th, and below on the 29th and 30th. The lowest reading in the month at a level was 29·17 ins. on the 1st, and the highest was 30·24 ins. on the 27th. The mean ading for the month at sea level was 29·843 ins., being 0·100 in. below the average. On the t and 2nd of May the barometer readings were below their averages, on the 3rd, 4th, and 5th, ey were above, from the 6th to the 20th (with the exception of the 17th) they were below, the 21st and 22nd they were above, from the 23rd to the 28th they were again below, d on the 29th, 30th, and 31st they were above their averages. The highest reading in the nth at sea level was 30·16 ins. on the 30th, and the lowest was 29·30 ins. on the 24th. The an reading for the month at sea level was 29·798 ins., being 0·168 in. below the average, and ck to 1841 there is no instance of so low a mean reading for May as that in the present year. ie readings of the barometer on the 1st and 2nd of June were a little above their averages; a tle below on the 3rd and 4th, above on the 5th, 6th, and 7th, below from the 8th to the 18th, ove from the 19th to the 27th, and again below on the last three days of the month. The maxi-um reading in the month at sea level was 30·24 ins. on the 6th, and the minimum was 29·52 ins. the 11th. The mean reading for the month at sea level was 29·950 ins., being 0·044 in. below e average.

The increase of mean monthly temperature from March to April South of latitude 51° was 4°·6 d North of this parallel was very uniform and of the mean value of 5°·2; from April to

South of latitude 51° was 5°·3, between latitude 51° and 52° was 6°·4, between 52° and 53° was 6°·8, and North of 53° was 5°·3; and from May to June South of 51° was 5°·4, between 51° and 52° was 5°·6, and North of 52° was 5°·2. The mean *increase* from all stations from March to April was 5°·0, from April to May was 5°·8, and from May to June was 5°·3.

At Greenwich *the mean temperature* of April was above that of March by 6°·2; that of May above that of April was 7°·0, and that of June above that of May was 5°·1. (From the preceding 37 years' observations the *mean temperature* of April is higher than that of March by 5°·5; that of May is higher than that of April by 5°·5; and that of June is higher than that of May by 6°·4.)

The mean temperature of the air for April was 48°·2, being 2°·1 and 1°·1 above the averages of the preceding 107 years, and 37 years respectively. It was 2°·8 higher than the value in 1877.

The mean temperature of the air for May was 55°·2, being 2°·7 and 2°·6 above the averages of the preceding 107 years, and 37 years respectively. It was 6°·3 higher than the value in 1877.

The mean temperature of the air for June was 60°·3, being 2°·1 and 1°·3 above the averages of the preceding 107 years, and 37 years respectively. It was 1°·0 lower than the value in 1877.

The mean temperature of the air for the quarter was 54°·6, being 2°·3 and 1°·7 above the averages of the preceding 107 years and 37 years respectively. It was 2°·7 higher than the value in 1877.

The mean high day temperatures of the air were 0°·1, 1°·0, and 0°·1 respectively above their averages in April, May, and June.

The mean low night temperatures of the air were 1°·1, 3°·7, and 0°·9 respectively above their averages in April, May, and June. Therefore the nights were warm throughout the quarter.

The mean daily ranges of temperature were 1°·0, 2°·7, and 0°·6 respectively less than their averages in April, May, and June.

At Greenwich the atmospheric pressure in April was less than in March by 0·227 in., in May was less than in April by 0·045 in., and in June was greater than in May by 0·152 in. (From the preceding 37 years' observations the mean pressure in April is greater than in March by 0·027 in., in May greater than in April by 0·023 in., and in June greater than in May by 0·028 in.) The mean atmospheric pressure decreased from March to April South of latitude 51° by 0·326 in., between 51° and 52° by 0·242 in., between 52° and 53° by 0·200 in., between 53° and 54° by 0·211 in., and North of 54° by 0·198 in. From April to May there was a further decrease at all stations, excepting Guernsey, where there was a small increase; South of latitude 51° the decrease was 0·010 in., between 51° and 52° it was 0·035 in., between 52° and 53° it was 0·074 in., between 53° and 54° it was 0·088 in., and North of 54° it was 0·107 in. From May to June there was an increase, at stations South of latitude 51° it was 0·142 in., between 51° and 52° it was 0·154 in., between 52° and 53° it was 0·166 in., between 53° and 54° it was 0·172 in., and North of 54° it was 0·190 in. The mean decrease from all stations from March to April was 0·237 in., from April to May was 0·057 in., and the mean increase from May to June was 0·165 in.

1878. Months.	Temperature of Air. Mean.	Air. Diff. from average of 107 years.	Air. Diff. from average of 37 years.	Temperature of Evaporation. Mean.	Evaporation. Diff. from average of 37 years.	Dew Point. Mean.	Dew Point. Diff. from average of 37 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 37 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 37 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour in a Cubic Foot of Air. Diff. from average of 37 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
April -	48·2	+2·1	+1·1	45·2	+1·2	42·0	+1·4	17·6	−1·0	48·3	0·266	+0·012	3·0	+0·1
May -	55·2	+2·7	+2·6	51·6	+2·7	48·1	+3·0	17·8	−2·7	59·0	0·332	+0·033	3·6	+0·3
June -	60·3	+2·1	+1·3	55·8	+1·3	51·8	+1·2	20·6	−0·6	60·9	0·387	+0·017	4·3	+0·2
Means -	54·6	+2·3	+1·7	50·9	+1·7	47·3	+1·9	18·7	−1·4	56·1	0·328	+0·021	3·7	+0·2

1878. Months.	Degree of Humidity. Mean.	Degree of Humidity. Diff. from average of 37 years.	Reading of Barometer. Mean.	Reading of Barometer. Diff. from average of 37 years.	Weight of a Cubic Foot of Air. Mean.	Weight of a Cubic Foot of Air. Diff. from average of 37 years.	Rain. Amount.	Rain. Diff. from average of 63 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
April -	79	+1	29·603	−0·100	541	− 2	4·3	+2·6	281	8	16	6	22·0	48·0
May -	78	+2	29·618	−0·168	532	− 9	4·3	+2·3	289	0	8	23	31·6	55·3
June -	74	0	29·770	−0·044	530	− 2	4·6	+2·7	205	0	1	29	38·0	54·3
Means -	77	+1	29·684	−0·104	534	− 4	Sum 13·2	Sum +7·6	Mean 258	Sum 8	Sum 25	Sum 58	Lowest 22·0	Highest 55·3

NOTE.—In reading this table it will be borne in mind that the plus sign (+) signifies *above* the average, and that the *minus sign (−) signifies below* the average.

The fall of rain in April was 4·3 ins., in May was also 4·3 ins., and in June was 4·6 ins., being respectively 2·6 ins., 2·3 ins., and 2·7 ins. in excess of their averages. The total fall of rain in the quarter was no less than 13·2 ins., being 7·6 ins. in excess of the average.

There is but one instance back to 1815 when the fall in April was as large as 4·3 ins., viz., in the year 1829 when it was 4·8 ins. There is likewise but one instance when the fall in May was as large as 4·3 ins., viz., in the year 1817 when it was 4·6 ins. And there are but two instances when the fall in June was larger than 4·6 ins., viz., in the year 1838 when it was 5·1 ins., and in 1860 when it was 5·8 ins.; in the year 1852 the fall in June was the same as in the present year, viz., 4·6 ins.

The average duration of the different directions of the wind referred to eight points of the compass, and the duration of each direction in each month in the quarter were as follows:—

Direction of Wind.	April.			May.			June.		
	Average.	1878.	Departure from Average.	Average.	1878.	Departure from Average.	Average.	1878.	Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	2½	2	−½	1¾	1	−¾	2	1	−1
N.	4	1	−3	4¼	1	−3¼	3½	2	−1½
N.E.	6	4	−2	7	2	−5	3½	3	−½
E.	3½	5	+1½	2½	1	−1½	2½	5	+2½
S.E.	2	4	+2	1¾	4	+2¼	1¾	5	+3¼
S.	2½	5	+2½	2¾	6	+3¼	2¼	3	+¾
S.W.	6¼	8	+1¾	7½	10	+2½	2¾	6	−3¾
W.	2½	1	−1½	2	6	+4	3¼	4	+¾
Calm (nearly.)	1	0	−1	2	0	−2	1½	1	−½

The plus sign (+) denotes excesses over averages; the largest numbers affected with this sign in the month of April are opposite to the S.E. and S., in May to the S. and W., and in June to the E. and S.E.

The minus sign (−) denotes defects below averages; the largest numbers affected with this sign in the month of April are opposite to the N. and N.E., in May also to the N. and N.E., and in June to the S.W.

Thunderstorms occurred on 3 days in April, on 18 days in May (there being a general absence of such storms at southern stations until the 10th day), and on 15 days in June.

Thunder was heard but lightning was not seen on 3 days in April, 17 days in May, and 18 days in June.

Lightning was seen but thunder was not heard, on one day in April, viz., the 30th, at several stations, on 9 days in May, and on 9 days in June.

Solar halos were seen on 5 days in April, 12 days in May, and on 6 days in June, or on 23 days during the quarter.

Lunar halos were seen on 5 nights in April, 2 nights in May, and on 3 nights in June.

Aurora Borealis was seen, on the 3rd of April at Torquay.

Snow fell on the 1st of April at many places; on the 2nd at Hull and North Shields, and on the 17th at Marlborough. On the 14th of May at Leicester, and on the 21st at Halifax.

Hail fell on 6 days in April, 12 days in May, and on 2 days in June.

Fog prevailed on 33 different days during the quarter; 17 days of which occurred in April.

Field Elm in Leaf, the earliest, April 21st at Oxford and Guernsey, the latest, May 1st at Osborne.

Wych Elm „ „ „ 21st at Oxford „ „ 7th at Torquay.
Oak „ „ „ 21st at Strathfield „ „ 7th at Torquay.
Lime „ „ „ 9th at Strathfield „ April 27th at Guernsey.
Sycamore „ „ „ 1st at Strathfield „ „ 23rd at Torquay.
Horsechestnut „ „ „ 7th at Osborne „ „ 20th at Torquay.
Common Poplar „ „ „ 10th at Strathfield „ May 13th at Llandudno.
Hawthorn „ „ „ 1st at Osborne „ „ 5th at Silloth.
Hazel „ „ „ 20th at Oxford „ „ 7th at Torquay.
Apple in Blossom „ „ 19th at Llandudno „ April 28th at Weybridge.
Pear „ „ „ 5th at Silloth „ „ 27th at Torquay.
Lilac „ „ „ 21st at Oxford „ May 6th at Llandudno.
Laburnum „ „ „ 29th at Silloth „ „ 5th at Oxford.
Honeysuckle „ „ June 2nd at Weybridge „ June 10th at Torquay.
Wheat in Flower „ „ 15th at Llandudno „ „ 26th at Kelstern.
Wheat in Ear „ „ 8th at Cardington „ „ 13th at Strathfield and Weybridge.
Barley „ „ „ 20th at Cardington and Llandudno „ „ 25th at Kelstern.
Cuckoo arrived „ April 14th at Stonyhurst „ May 3rd at Royston.
Swallow „ „ „ 7th at Osborne „ „ 10th at Torquay.
Nightingale „ „ 14th at Weybridge „ April 18th at Streatley.

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days on which it fell.	Rain. Mean Amount collected.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
Guernsey	29·493	61·0	37·5	43·5	59·4	49·4	25·7	10·0	53·6	49·6	·357	4·0	0·7	86	534	—	—	1·3	6	7	9	9	8·8	4·8	45	10·72
Helston	29·501	65·0	34·0	31·0	63·9	48·1	30·0	15·8	54·3	48·6	·337	3·8	1·0	79	533	79·0	44·6	2	7	4	7	11	8	5·2	4·0	54	10·8
Truro	29·486	64·0	28·5	35·5	62·0	44·0	36·0	14·0	52·6	48·1	·326	3·8	0·7	85	528	—	—	2·7	5	8	10	8	—	6·5	54	11·32
Eastbourne	29·469	63·0	27·7	35·3	63·3	47·3	37·0	16·0	54·1	49·1	·329	4·0	0·9	84	537	113·6	39·6	0·8	4	7	9	11	1·9	1	58	7·71
Plymouth	29·532	62·0	31·0	31·0	60·5	48·9	31·0	11·6	53·8	49·1	·331	4·0	0·8	84	537	—	48·1	1·4	5	6	10	9	—	6·9	62	11·72
Torquay	29·515	72·8	31·6	41·2	59·2	47·0	28·7	11·6	53·2	47·3	·328	3·7	0·7	85	534	129·2	42·2	1·2	5	8	7	10	4·6	6·6	63	11·26
Ventnor	29·507	61·4	31·0	30·0	63·0	49·4	31·4	13·6	54·2	50·1	·356	4·1	0·7	87	533	—	—	3	9	9	9	7·0	5·1	41	6·22
Osborne	29·473	67·3	28·8	37·5	61·2	47·1	34·1	17·1	51·1	51·2	·381	4·3	0·6	89	534	118·9	43·5	0·4	3	7	13	8	—	5·8	42	7·76
Bournemouth	29·538	67·5	31·6	36·3	60·7	47·6	32·4	12·9	53·3	46·1	·314	3·6	1·1	77	537	—	—	—	5	8	8	9	—	3·9	46	6·8
Brighton	29·542	61·0	28·2	32·8	62·3	47·7	32·0	14·6	54·1	46·8	·323	3·7	1·1	80	531	107·0	44·8	0·9	4	8	10	8	—	6·0	45	9·22
Salisbury	29·544	69·0	25·0	44·0	66·0	43·7	37·0	22·2	53·6	44·1	·335	4·0	0·7	85	535	113·1	43·2	1·4	4	9	9	8	—	6·4	52	11·76
Barnstaple	29·478	67·0	35·0	32·0	64·7	50·2	35·3	14·5	55·6	48·5	·345	3·9	1·2	77	533	—	—	1·2	4	6	12	9	—	4·0	54	10·43
Bath	29·512	64·9	29·1	35·8	60·6	41·3	35·9	14·3	51·3	47·0	·326	3·7	0·6	86	529	122·2	—	1·3	4	7	10	9	—	6·5	55	14·62
Ramsgate	29·518	62·7	29·7	35·0	59·9	45·0	32·8	11·9	51·6	47·4	·331	3·8	0·8	83	538	110·7	42·6	1·3	6	7	9	8	—	5·7	46	7·76
Strathfield Turgiss	29·525	68·5	27·9	40·6	65·8	44·9	32·9	18·9	51·3	47·2	·328	3·7	0·9	80	535	115·0	40·9	0·8	3	6	11	10	1·9	6·3	46	6·32
Weybridge Heath	29·530	69·0	25·8	43·2	66·1	44·5	41·5	21·6	54·1	48·1	·340	3·8	0·9	81	533	102·1	40·8	0·8	6	8	12	5	0·6	5·7	50	10·24
Marlborough Green	29·526	67·8	25·8	42·0	62·5	45·6	40·0	16·9	52·7	47·0	·332	3·7	0·9	81	536	112·7	41·3	0·5	4	9	9	9	—	6·6	53	10·88
Blackheath	29·522	69·2	27·7	42·5	64·7	46·2	41·6	19·7	53·5	47·3	·330	3·7	1·0	79	535	119·5	42·1	1·0	4	7	11	8	—	6·1	49	11·12
Streatley Vicarage	29·508	69·5	27·2	42·3	64·0	48·1	42·3	16·5	54·7	49·0	·352	4·0	0·9	81	534	—	—	1·5	5	8	9	—	—	6·5	57	9·26
Camden Square	29·525	67·5	27·2	40·3	65·4	47·0	41·8	18·4	54·7	47·9	·337	3·8	1·1	78	533	108·0	43·6	—	7	6	8	—	—	6·2	50	15·37
Oxford	29·503	67·1	28·4	38·7	63·8	47·2	40·1	16·6	55·1	48·5	·344	3·9	1·1	78	533	111·7	43·9	0·7	4	8	11	—	3·2	7·1	49	9·19
Royston	29·516	69·7	22·2	47·5	65·0	43·3	46·8	21·1	53·0	47·9	·337	3·8	0·8	83	534	—	—	—	6	6	9	—	—	6·3	43	7·69
Carlington	29·512	69·0	26·2	42·8	65·1	45·5	44·0	19·6	54·2	47·2	·331	3·7	1·1	77	536	100·1	40·2	1·2	4	7	9	6	—	6·4	49	8·49
Cambridge	29·496	69·0	23·6	46·4	66·4	45·2	45·3	21·2	54·1	47·7	·334	3·8	1·0	80	536	128·9	41·6	1·1	4	8	10	—	—	6·5	50	8·39
Somerleyton	29·491	81·5	17·0	64·5	69·2	48·1	40·0	18·0	52·3	49·6	·359	4·0	0·5	90	539	—	—	1·1	4	10	10	—	7·6	5·8	44	8·99
Norwich	29·538	87·0	25·0	62·0	69·1	47·5	9·8	15·6	53·7	47·4	·330	3·7	1·0	81	537	—	—	—	3	10	12	—	—	5·9	38	9·09
Wolverhampton	29·491	87·0	24·5	62·5	61·9	44·1	10·2	17·6	51·8	45·0	·302	3·4	1·0	75	529	—	—	—	5	7	12	—	—	7·4	49	12·44
Leicester	29·531	65·0	27·2	37·8	61·9	46·1	7·6	13·8	53·5	46·7	·307	3·2	1·2	73	534	115·2	39·3	0·9	4	8	11	—	—	6·8	54	8·93
Nottingham	29·491	68·5	25·9	41·6	64·8	44·6	45·1	20·2	53·1	47·6	·334	3·8	0·9	82	535	107·4	43·8	0·4	5	10	10	—	8·2	6·7	55	7·95
Hickham	29·546	66·6	27·8	42·8	62·3	43·1	44·2	19·1	51·8	46·5	·320	3·6	0·8	82	539	119·3	38·7	1·5	6	6	13	—	—	6·3	43	6·73
Grandudno	29·495	63·0	31·0	32·0	62·0	47·8	38·4	14·2	53·6	48·9	·343	3·5	1·2	76	536	—	—	0·8	5	8	7	10	—	5·7	46	5·52
Kelstern Grange	29·525	62·8	29·0	62·8	59·5	45·2	41·2	13·6	50·5	46·7	·321	3·6	0·6	87	534	114·8	40·8	0·9	5	9	10	7	·9	6·3	51	6·98
Liverpool	29·479	65·0	31·5	52·5	59·9	47·5	32·6	12·4	52·5	46·6	·322	3·7	0·9	81	536	—	—	1·0	5	10	7	8	—	5·9	51	8·19
Eccles	29·522	69·1	26·9	62·2	62·7	43·6	44·0	19·1	52·5	45·3	·305	3·5	1·0	77	536	78·9	39·9	0·3	5	7	11	8	1·7	6·6	53	9·55
Hull	29·511	65·0	25·0	60·0	62·0	44·7	40·7	17·6	52·0	46·9	·323	3·7	0·8	83	539	92·6	43·0	—	—	—	—	—	·9	—	41	6·44
Stonyhurst	29·509	67·2	28·0	39·2	62·1	43·2	39·9	18·9	51·2	47·5	·399	3·5	0·7	82	533	117·2	42·3	1·4	5	12	5	8	—	7·0	49	9·37
Leeds	29·543	69·0	30·0	39·0	61·7	45·3	37·7	16·5	51·7	44·0	·291	3·3	1·2	76	537	72·2	—	1·3	4	11	6	10	—	4·1	44	10·37
Bradford	29·525	67·8	29·2	37·6	59·8	45·7	36·7	14·1	51·1	44·3	·284	3·3	0·9	78	534	75·9	—	0·8	7	5	8	9	—	6·4	47	10·19
Cockermouth	29·511	65·8	28·2	30·6	61·2	46·0	40·3	15·2	52·4	44·3	·294	3·3	1·2	74	530	102·7	37·9	0·4	4	10	8	8	1·9	5·9	53	6·38
Allenheads	—	—	—	23·0	—	—	40·6	—	—	—	—	—	—	—	—	105·6	—	0·5	—	—	—	—	—	6·4	45	10·45
Silloth	29·508	64·6	29·5	35·1	64·0	44·4	44·9	19·6	52·6	45·7	·310	3·5	1·0	78	538	95·8	41·1	1·3	3	10	—	9	7·8	4·4	43	6·19
Bywell	29·495	63·0	30·0	36·0	61·4	46·3	40·0	15·1	51·7	45·7	·311	3·5	0·9	81	537	78·2	40·9	1·2	5	12	—	8	—	5·4	48	9·75

The highest temperatures of the air were at Silloth, 91°·6; Llandudno, 93°·0; Blackheath, 90°·2; and Salisbury, Weybridge, and Leeds, all 90°·0.

The lowest temperatures of the air were at Somerleyton, 17°·0; Kelstern Grange, 20°·0; Royston, 23°·2; and Allenheads, 23°·0.

The greatest daily ranges of the temperatures of the air were at Salisbury, 22°·2; Weybridge, 21°·6; and Cambridge, 21°·2.

The least daily ranges of the temperatures of the air were at Guernsey, 10°·0; Plymouth and Torquay, both 11°·6; and Ramsgate, 11°·9.

The greatest number of rainy days were at Truro, 64; Torquay, 63; Plymouth, 62; Streatley, 57; and Bath and Nottingham, both 55.

The least number of rainy days were at Norwich, 38; Ventnor and Hull, both 41; and Osborne, 42.

The heaviest falls of rain were at Camden Square, 15·37 inches; Bath, 14·62 inches; and Wolverhampton, 12·44 inches.

The least falls of rain were at Llandudno, 5·52 inches; Somerleyton, 5·59 inches; and Norwich, 5·69 inches.

Quarterly Meteorological Table for different Parallels of Latitude.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature in the Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Mean Reading of Minimum on Grass.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Mean Number of Days it fell.	Rain. Mean Amount collected.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
Guernsey	29·493	61·0	37·5	43·5	59·4	49·4	25·7	10·0	53·6	49·6	·357	4·0	0·7	86	534	—	—	1·3	6	7	9	9	8·8	4·8	45	10·72
Between 50° and 51°	29·319	81·8	39·8	51·0	61·9	48·1	33·1	13·8	53·6	48·6	·345	3·9	0·8	83	534	109·3	44·6	1·6	4	8	10	9	5·6	5·5	53	9·12
Between 51° and 52°	29·316	87·4	38·2	50·2	63·8	46·3	35·3	13·6	53·8	47·9	·338	3·8	0·9	81	534	111·8	42·3	1·0	5	7	10	8	1·9	6·1	51	10·99
Between 52° and 53°	29·510	87·5	33·6	53·9	63·7	45·0	42·6	18·7	52·0	47·2	·327	3·7	0·9	81	535	114·2	40·6	1·1	5	8	11	7	5·4	6·3	46	7·93
Between 53° and 54°	29·512	87·5	28·3	59·2	61·2	45·2	38·9	16·0	51·9	45·7	·310	3·5	0·9	80	536	91·9	40·7	0·9	5	9	8	8	5·8	6·0	44	8·29
Between 54° and 55°	29·495	89·8	29·2	60·6	62·2	45·6	41·7	14·6	52·2	45·2	·305	3·4	1·0	78	537	93·6	40·0	0·9	4	11	7	8	4·6	5·8	45	8·23
Mean for the Quarter, 50° to 55° Year 1875	29·663	78·7	29·3	49·4	62·1	44·2	39·3	18·2	52·0	45·1	·305	3·5	1·0	77	539	108·7	39·5	1·2	6	6	8	11	4·3	5·9	52	8·76
Mean for the Quarter, 50° to 55° „ 1876	29·703	82·6	28·3	54·3	61·1	43·1	40·3	18·0	50·9	43·8	·280	3·5	0·9	78	541	101·4	37·8	1·0	7	8	6	8	4·1	5·5	34	5·52
Mean for the Quarter, 50° to 55° „ 1877	29·586	81·1	29·0	52·1	59·8	43·9	35·1	15·9	50·5	43·6	·289	3·5	1·0	78	539	98·7	38·8	1·3	7	9	8	7	4·8	6·2	41	6·76
Mean for the Quarter, 50° to 55° „ 1878	29·510	85·8	28·0	58·8	62·6	46·1	39·2	16·5	52·9	46·9	·325	3·7	0·9	81	536	104·8	41·6	1·1	5	9	9	8	4·3	5·9	49	8·89

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING SEPTEMBER 30, 1878.

REMARKS ON THE WEATHER DURING THE QUARTER ENDING SEPTEMBER 30TH, 1878.

By JAMES GLAISHER, Esq., F.R.S., *&c.*

THE weather at the beginning of July was cold, it somewhat moderated from the 5th to the 8th, but cool and cloudy weather was experienced till the 15th, and the average daily deficiency of temperature for the first 15 days of the quarter was 1°. On the 16th the weather underwent a favourable change to higher temperature, bright sunshine, and no rain. The hottest day in the month was the 19th, on which day the temperature in the shade exceeded 80° at all the stations excepting Guernsey and Torquay; it was nearly 90° at many stations and 90°·2 at Halifax, and 92° at Leeds; this warm period continued till the 24th, the average excess of mean temperature was 7¼° daily; on the 25th the weather was cool and was changeable to August 3rd but chiefly cold, the average daily deficiency of mean temperature for these ten days was 1°. On August 3rd and 4th at stations South of 53° thunderstorms were general, and at some stations more than one inch of rain fell; from the 4th to the 11th the daily excess of mean temperature was 3°·6; from the 12th to the 21st the temperature was nearly that of its average, the sky was mostly cloudy and rain fell on nearly every day; on the 22nd a warm period began, but the weather continued unsettled till the end of August with nearly constant rain and frequent thunderstorms over the country; at the beginning of September the weather was clear and bright, without rain; the mean excess of daily temperature for the 21 days ending September 11th was 1°·9 daily; from the 12th to the end of the month, the changes in temperature were frequent and the weather was mostly cold; the average deficiency of temperature for the last 15 days of the quarter was 2°·1 daily.

The readings of the barometer in the neighbourhood of London were a little below their averages during the first three days of July; they were 0·082 in. above till the 9th; the next four days were a little below; from July 14th to the 23rd they were on the daily average 0·191 in. in excess; on the 24th the lowest reading in the month took place, viz., 29·67 ins. at sea level, the next four days were on the average 0·15 in. too low; from July 28th to August 2nd the atmospheric pressure was in excess averaging 0·20 in. daily. On July 31st the highest reading in the month, 30·38 ins. at sea level, took place. From August 3rd to the end of the month the readings of the barometer (with the exception of the 8th, 9th, 18th, and 21st, which were slightly in excess of their averages) were low, and particularly so on the 14th, 16th, 23rd, 24th, 25th, 26th, 29th, and 30th, on which days the daily values were nearly half an inch below these averages; the average daily deficiency of atmospheric pressure from August 3rd to the end of the month was 0·24 in.; the highest and lowest readings in the month at sea level were 30·32 ins. on the 1st and 29·46 ins. on the 14th. From September 1st to the 14th the readings of the barometer were generally above their averages, the mean daily excess was 0·07 in.; from the 14th to the 24th the readings were low with the exception of the 20th, and the average deficiency of daily pressure for these 12 days was 0·15 in., and from the 25th to the end of the quarter the average daily excess was 0·15 in. The highest and lowest readings in September at sea level were 30·50 ins. and 29·46 ins. The mean reading of the barometer at sea level for July was 30·03 ins., for August was 29·75 ins., and for September was 29·99 ins., being respectively 0·06 in. above, 0·21 in. below, and 0·015 in. above the average of 37 years.

The atmospheric pressure in July was greater than in June by 0·093 in., that in August was less than that in July by 0·277 in., and that in September was greater than that in August by 0·233 in. (From the preceding 37 years' observations the *mean pressure* in July is 0·011 in. less than in June, that in August is 0·011 in. less than in July, and that in September is 0·012 in. greater than in August). The mean increase of pressure from June to July from all stations was 0·113 in., the mean decrease from July to August was nearly the same everywhere and the mean from all stations was 0·295 in., and the mean increase from August to September South of latitude 51° was 0·264 in., between 51° and 52° was 0·241 in., between 52° and 53° was 0·223 in., between 53° and 54° was 0·192 in., and North of 54° was 0·147 in.

At Greenwich *the mean temperature* of July was higher than in June by 2°·8; that of August was below that of July by 0°·4, and that of September was below that of August by 6°·0. (From the preceding 37 years' observations the *mean temperature* of July is higher than that of June by 3°·2, that of August is lower than that of July by 0°·7, and that of September is lower than that of August by 4°·4.) The increase of mean temperature from June to July was nearly the same at all stations, its general mean was 3°·1; the decrease from July to August was nearly uniform, the mean from all stations was 0°·7; the further decrease to September was different, at stations South of latitude 51° it was 3°·7, at those between 51° and 52° it was 5°·2, between 52° and 53° it was 5°·0, between 53° and 54° it was 4°·5, and at those stations North of latitude 54° it was 4°·1.

The mean temperature of the air for July was 63°·1, being 1°·5 and 0°·9 above the averages of the preceding 107 years, and 37 years respectively. It was 2°·3 higher than the value recorded in 1877.

The mean temperature of the air for August was 62°·7, being 0°·9 and 1°·2 above the averages of the preceding 107 years, and 37 years respectively. It was 1°·0 higher than the value in 1877.

The mean temperature of the air for September was 56°·7, being 0°·2 above the average of the preceding 107 years, and 0°·4 *below* the average of the preceding 37 years. It was 3°·8 higher than the value in 1877.

The mean temperature of the air for the quarter was 60°·8, being 0°·9 and 0°·6 above the averages of the preceding 107 years and 37 years respectively.

The mean high day temperatures of the air were 0°·5, 0°·2, and 0°·7 respectively below their averages in July, August, and September.

The mean low night temperatures of the air were 1°·0 and 2°·2 above their averages in July and August, but 0·5 below in September. Therefore the days were somewhat cool throughout the quarter, and the nights were warm.

The mean daily ranges of temperature were 1°·6, 2°·4, and 0°·2 respectively less than their averages in July, August, and September.

The fall of rain during the month of July was very small; at many stations the amount for the whole month was less than one inch, and it is the smallest rain-fall recorded for many years in July.

At Greenwich the fall of rain in July was 0·3 in. only, and we have to travel back for 53 years for a fall of rain in this month of a smaller amount, viz., 1825, when the fall was 0·1 in. only. The fall in the month of August was on the other hand excessive; rain fell on two days out of three during the month; on the 3rd at Bywell to the depth of 1·92 ins., and at several places to more than an inch; on the 4th at Leicester 1·78 ins. fell; on the 13th the fall exceeded one inch at many places; and falls exceeding an inch took place at different stations on the 23rd and 30th. The fall at Greenwich for the month was 5·4 ins. being a fall greater in amount than in any August back to the year 1815, and was greater than in any month at Greenwich since July 1867, when the fall was 5·8 ins. The fall of rain in September was generally small, but in some few places it was a little above the average.

The fall of rain in July at Greenwich was 0·3 in., being 2·3 ins. below the average. Back to 1815 there are but three instances of so small a fall in July as that in the present year, viz.:—In the year 1825 when the fall was 0·1 in., in 1835 when it was 0·3 in., and in 1864 when it was 0·3 in. The fall in August was 5·4 ins., being 3·0 in., above the average for August, and in the preceding 63 years there is *no* instance of so large a fall in the month of August as that in the present year; the nearest approach is 4·6 ins. in the year 1837. The fall in September was 0·8 in., being 1·6 ins. below the average; and there are but five instances of so small a fall in September in the preceding 63 years, viz.—In the year 1832 it was 0·4 in.; in 1843 it was 0·5 in., in 1851 it was 0·4 in., in 1854 it was 0·7 in., and in 1865 it was 0·2 in.

Thunderstorms occurred on the 1st of July at Guernsey; on the 19th at Salisbury and Bath; on the 20th at Guernsey and Torquay; on the 21st at Guernsey, Torquay, and Plymouth; on the 22nd at Truro, Ventnor, Plymouth, Salisbury, London, Bath, and Strathfield, &c.; on the 23rd at Cardington, London, Norwich, Kelstern, and Bywell; on the 24th at London, Streatley, Oxford, Royston, and Liverpool; on the 25th at Eccles and Bywell; on the 26th at London; and on the 27th at Cardington and Halifax. On the 3rd of August at Torquay, Osborne, Bournemouth, London, Salisbury, Bath, Strathfield, Marlborough, Streatley, Oxford, Royston, Cardington, Bywell, North Shields, &c.; on the 4th at Streatley, London, Oxford, Royston, Somerleyton, and Stockton; on the 5th at Oxford, Silloth, and Carlisle; on the 6th at Oxford, Kelstern, Liverpool, Llandudno, Halifax, Hull, Stonyhurst, Bradford, Carlisle; on the 7th at Cardington, Kelstern, Eccles, Halifax, Hull, and Stonyhurst; on the 10th at Royston, Cardington, Cambridge, and Stockton; on the 15th at Guernsey and Eccles; on the 16th at Bournemouth, Strathfield, Royston, Cardington, Somerleyton, Halifax, Bradford, Leeds, Silloth, and North Shields; on the 17th at Bywell; on the 23rd at Guernsey, Bath, Streatley, Oxford, and Cardington; on the 24th at Torquay, Plymouth, Osborne, Bournemouth, Royston, Cardington, Cambridge, Stockton, and Leeds; on the 25th at Carlisle; on the 27th at Eccles, Halifax, Stonyhurst, Bywell, and North Shields; on the 28th at Guernsey, Osborne, and Bournemouth; on the 29th at Torquay, London, Salisbury, Marlborough, Streatley, Oxford, Cardington, Somerleyton, Cambridge, Eccles, and Stonyhurst; on the 30th at Salisbury, London, Cardington, Stockton, Kelstern, and Stonyhurst; on the 31st at Somerleyton, and Halifax. On the 8th of September at Plymouth, Osborne, Stockton, and Cardington; on the 18th at Eccles, Halifax, and Carlisle; on the 19th at Osborne and Stonyhurst; on the 22nd at Salisbury; on the 23rd at Hull; on the 30th at Royston, Cardington, Somerleyton, Cambridge, Stockton, Leicester, Wolverhampton, Kelstern, and Hull.

Thunder was heard but lightning was not seen on the 1st of July at Caterham; on the 21st at Torquay, Plymouth, Cockermouth, Silloth, Carlisle, and Bywell; on the 22nd at Guernsey, Streatley, Wolverhampton, and Liverpool; on the 23rd at Bournemouth, Bath, Streatley, and Oxford; on the 24th at Oxford, Royston, Cardington, Cambridge, Wolverhampton, Eccles, Llandudno, Hull, and Stonyhurst; on the 25th at Streatley, Kelstern, and Hull; on the 26th at Oxford and Hull. On the 3rd of August at Oxford; on the 4th at Hull; on the 6th at Royston; on the 7th at Streatley, Royston, Carlisle, and North Shields; on the 10th at Bath; on the 12th at Oxford and Cambridge; on the 14th at Cardington, Cambridge, and Kelstern; on the 15th at Hull; on the 16th at Wolverhampton, Kelstern, Hull, Stonyhurst, and Cockermouth; on the 17th at Hull; on the 23rd at Marlborough; on the 24th at Torquay, Plymouth, and Royston; on the 25th at Somerleyton, Cambridge, Hull, and Cockermouth; on the 26th at Kelstern; on the 27th at Hull; on the 28th at Kelstern; on the 29th at Royston and Hull; on the 30th at Marlborough, Oxford, Royston, Wolverhampton, and Carlisle; on the 31st at Wolverhampton, Hull and Cockermouth. On the 3rd of September at Bath; on the 5th at Norwich; on the 8th at Bath, Weybridge, Marlborough, Royston, Cambridge, and Kelstern; on the 19th at Cardington and Halifax; on the 23rd at Wolverhampton and Kelstern; and on the 26th at *Oxford*.

1878. Months.	Temperature of Air. Mean.	Air. Diff. from average of 107 years.	Air. Diff. from average of 37 years.	Evaporation. Mean.	Evaporation. Diff. from average of 37 years.	Dew Point. Mean.	Dew Point. Diff. from average of 37 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 37 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 37 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour in a Cubic Foot of Air. Diff. from average of 37 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
July -	63·1	+1·5	+0·9	58·6	+0·9	54·7	+0·8	19·6	−1·6	67·7	0·430	+0·013	4·8	+0·2
Aug. -	62·7	+0·9	+1·2	59·1	+1·7	56·1	+2·3	17·5	−2·4	66·2	0·451	+0·033	5·0	+0·4
Sept. -	56·7	+0·2	−0·4	53·7	−0·2	50·9	−0·1	18·3	−0·2	58·4	0·373	−0·005	4·2	0·0
Means -	60·8	+0·9	+0·6	57·1	+0·8	53·9	+1·0	18·5	−1·4	64·1	0·418	+0·014	4·7	+0·2

1878. Months	Degree of Humidity. Mean.	Degree of Humidity. Diff. from average of 37 years.	Reading of Barometer. Mean.	Reading of Barometer. Diff. from average of 37 years.	Weight of a Cubic Foot of Air. Mean.	Weight of a Cubic Foot of Air. Diff. from average of 37 years.	Rain. Amount.	Rain. Diff. from average of 63 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
July -	75	0	29·863	+0·020	528	0	0·3	−2·3	218	0	2	29	39·0	60·2
Aug. -	79	+3	29·586	−0·206	523	− 6	5·4	+3·0	261	0	0	31	45·0	57·0
Sept. -	81	+1	29·819	+0·015	534	+ 1	0·8	−1·6	248	0	10	20	31·6	55·1
Means -	78	+1	29·756	−0·044	528	− 2	Sum 6·5	Sum −0·9	Mean 242	Sum 0	Sum 12	Sum 80	Lowest 31·6	Highest 60·2

Note.—In reading this table it will be borne in mind that the plus sign (+) signifies *above* the average, and that the minus sign (−) signifies *below* the average.

The average duration of the different directions of the wind referred to eight points of the compass, and the duration of each direction in each month in the quarter were as follows:—

Direction of Wind.	July. Average.	July. 1878.	July. Departure from Average.	August. Average.	August. 1878.	August. Departure from Average.	September. Average.	September. 1878.	September. Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	2½	7	+4½	2	1	−1	1½	7	+5½
N.	3½	7	+3½	3	1	−2	3½	3	− ½
N.E.	3½	5	+1½	3	1	−2	5½	1	−4½
E.	1½	4	+2½	1½	5	+3½	1½	0	−1½
S.E.	½	1	+ ½	1½	6	+4½	1½	1	− ½
S.	2½	0	−2½	3	7	+4	2	3	+1
S.W.	10½	2	−8½	10½	8	−2½	7½	5	−2½
W.	4	5	+1	3½	2	−1½	2½	9	+6½
Calm (nearly.)	2½	0	−2½	3½	0	−3½	4½	1	−3½

The plus sign (+) denotes excesses over averages; the largest numbers affected with this sign in the month of July are opposite to the N., N.W., and E., in August to the E., S.E., and S., and in September to the N.W. and W.

The minus sign (−) denotes defects below averages; the largest numbers affected with this sign in the month of July are opposite to the S.W., in August to the N., N.E., and S.W., and in September to the N.E.

Lightning was seen but thunder was not heard, on 9 days in July, 12 days in August, and on 5 days in September.

Solar halos were seen on 2 days in July, 7 days in August, and 3 days in September.

Lunar halos were seen on six nights during the quarter.

Hail fell on the 24th of July at Oxford. On the 3rd of August at Royston and Cardington. On the 16th of September at Stonyhurst; on the 18th at Halifax, Cockermouth, and Carlisle; on the 19th at Cockermouth; on the 23rd at Eccles; and on the 30th at Llandudno.

Fog prevailed on 14 days in July; 14 days in August; and on 18 days in September.

Wheat Cut on the 17th of July at Helston; on the 24th at Osborne; on the 25th at Guernsey and Strathfield; and on the 29th at Cardington. On the 1st of August at Oxford and Stockton; on the 5th at Torquay; on the 13th at Kelstern; and on the 15th at Bath.

Barley Cut on the 25th of July at Guernsey and on the 31st at Cardington. On the 13th of August at Torquay. On the 3rd of September at Strathfield.

Oats Cut on the 8th of July at Helston; on the 22nd at Guernsey; and on the 30th at Osborne. On the 2nd of August at Oxford; and on the 13th at Torquay.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING SEPTEMBER 30TH, 1878.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the sixth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1878. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Dew Point.	Vapour. Elastic Force.	In a cubic foot of Air. Mean.	Short of Saturation.	Mean Degree of Humidity. Sat^n. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Minimum on Grass.	Wind. Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Amount collected.
	feet.		in.	in	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S., F.M.S.	204	July	29·838	0·362	73·0	52·5	20·5	67·3	57·0	10·3	60·3	58·2	·487	5·4	0·4	93	530	—	—	0·9	11	7	5	8	3·5	3·5	11	2·94
		Aug.	29·555	0·743	71·5	54·0	17·5	66·5	58·2	8·3	61·5	56·9	·463	5·1	1·0	85	524	—	—	1·3	3	5	13	10	3·8	5·2	16	2·76
		Sept.	29·817	0·812	68·0	47·5	20·5	61·5	54·5	9·0	58·5	52·6	·398	4·4	1·1	81	532	—	—	1·3	9	4	6	11	3·0	4·4	9	3·14
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	106	July	29·997	0·558	80·0	49·0	40·0	73·4	56·9	18·5	64·1	57·2	·469	5·2	1·4	78	529	94·2	52·0	1·5	13	8	5	5	4·7	2·2	11	2·00
		Aug.	29·708	0·742	80·0	47·0	33·0	72·8	55·8	17·0	62·6	56·5	·458	5·1	1·3	81	526	93·3	49·0	1·5	3	7	12	9	5·3	2·8	18	3·57
		Sept.	29·994	0·756	85·0	39·0	46·0	68·9	52·5	16·4	59·4	54·3	·423	4·7	0·9	84	534	87·5	43·4	1·2	7	5	8	10	2·7	2·4	10	2·28
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	July	30·008	0·520	85·0	46·0	39·0	73·2	56·0	17·2	62·4	55·0	·433	4·8	1·5	77	531	—	—	2·1	11	7	5	8	—	5·3	9	1·51
		Aug.	29·690	0·818	74·0	46·0	28·0	69·8	56·3	13·5	60·8	55·6	·442	4·9	1·0	83	527	—	—	2·6	3	5	10	13	—	6·5	24	4·49
		Sept.	29·970	0·743	75·0	43·0	32·0	64·3	52·2	14·1	58·4	51·4	·389	4·3	1·2	78	535	—	—	2·7	7	3	5	15	—	6·0	11	3·58
EASTBOURNE (Sussex), Miss W. L. Hall.	12	July	29·971	0·604	83·3	45·7	37·6	72·8	54·9	17·9	62·8	56·3	·455	5·0	1·1	82	530	123·2	46·9	0·2	8	10	5	8	1·3	—	8	0·97
		Aug.	29·705	0·858	74·0	50·7	23·3	70·9	56·8	14·1	62·9	58·8	·498	5·5	0·9	87	525	124·1	48·0	0·7	4	7	8	12	4·6	—	21	4·75
		Sept.	29·954	0·820	74·0	38·0	36·0	67·3	50·5	17·0	58·4	52·1	·391	4·4	1·1	80	535	116·8	41·2	0·3	8	3	6	13	0·8	—	12	2·35
PLYMOUTH (Devon), John Merrifield, Esq., F.R.A.S., F.M.S., LL.D.	69	July	30·003	0·596	81·0	49·5	31·5	71·3	57·3	14·0	63·0	56·6	·459	5·1	1·3	79	531	—	56·6	1·6	9	7	5	10	—	6·3	10	1·66
		Aug.	29·748	0·833	73·0	50·0	23·0	68·4	57·3	11·1	61·6	57·5	·475	5·2	0·9	89	527	—	56·7	1·6	4	7	11	9	—	7·7	21	5·35
		Sept.	30·025	0·772	72·0	40·5	31·5	65·0	51·5	13·5	57·5	52·7	·389	4·4	0·9	84	536	—	50·6	1·3	7	5	7	11	—	5·6	14	2·57
BABBACOMBE, Torquay (Devon), Edwin E. Glyde, Esq., F.M.S.	305	July	29·744	0·621	78·3	51·0	27·3	69·2	56·0	13·2	61·3	54·4	·424	4·8	1·3	78	528	138·0	49·8	0·9	8	8	3	12	2·8	5·9	9	1·51
		Aug.	29·435	—	72·8	49·0	23·8	68·0	56·3	11·7	60·8	55·7	·444	5·0	1·0	84	522	135·2	51·4	1·5	4	7	6	14	5·2	7·0	21	4·72
		Sept.	29·699	0·795	71·8	42·0	29·8	64·7	50·2	14·5	56·9	50·4	·366	4·1	1·1	79	532	129·3	43·0	1·2	4	4	4	18	3·4	5·7	11	1·73
VENTNOR (Royal National Hospital for Consumption), Isle of Wight, Hartley Sagar, Esq.	150	July	29·946	0·510	81·5	53·3	28·2	71·0	58·0	13·0	63·0	57·1	·468	5·1	1·3	81	530	—	—	—	4	10	6	11	7·6	5·5	12	4·13
		Aug.	—	0·859	70·0	55·0	15·0	66·4	59·3	7·1	61·7	56·4	·453	5·0	1·1	83	524	—	—	—	0	7	8	16	—	5·9	21	5·72
		Sept.	29·920	0·838	74·2	45·8	28·4	68·5	53·7	14·8	59·5	53·5	·410	4·6	1·1	81	533	—	—	—	3	3	5	19	7·5	4·7	11	1·91
OSBORNE (Isle of Wight), R. J. Mann, Esq.	172	July	29·849	0·673	87·4	43·1	44·7	75·5	55·7	19·8	63·6	61·8	·553	6·1	0·4	94	527	126·6	50·7	0·1	9	5	5	12	—	5·8	8	0·93
		Aug.	29·575	0·889	77·9	50·0	27·9	72·3	56·7	15·6	62·4	59·8	·515	5·7	0·5	92	523	121·2	53·5	0·2	4	7	12	8	—	7·1	15	2·94
		Sept.	29·822	0·839	75·7	39·0	36·7	67·6	50·8	16·8	57·8	53·6	·413	4·6	0·8	86	538	110·7	44·5	0·2	8	1	8	13	—	5·6	10	2·20
SOUTH BOURNE, near Bournemouth, (Hants), T. A. Compton, Esq., M.D., B.A., F.M.S.	128	July	29·939	0·620	84·1	45·5	38·6	71·1	54·3	16·8	61·8	52·5	·396	4·4	1·8	72	531	—	—	—	8	9	3	11	—	2·4	9	1·02
		Aug.	29·698	0·800	74·6	50·3	24·3	68·7	56·4	12·3	61·6	54·4	·423	4·7	1·4	78	524	—	—	—	3	8	5	15	—	4·3	15	3·26
		Sept.	29·896	0·800	71·5	35·3	36·2	64·1	49·1	15·0	56·6	48·7	·345	3·9	1·2	75	536	—	—	—	9	3	2	16	—	2·4	10	2·47
BRIGHTON (Sussex), F. E. Sawyer, Esq., F.M.S.	206	July	29·814	0·640	80·2	48·2	32·0	72·2	56·2	16·0	62·8	54·0	·417	4·6	1·7	73	527	118·6	53·9	0·7	7	6	9	9	—	4·3	9	1·05
		Aug.	29·564	0·873	74·5	50·5	24·0	70·4	54·8	13·6	62·6	53·2	·406	4·4	1·8	72	523	109·6	54·5	0·8	2	9	9	11	—	6·3	23	4·52
		Sept.	29·797	0·845	71·0	41·7	29·3	65·5	50·0	15·5	57·6	48·3	·338	3·8	1·5	70	533	101·7	47·6	0·8	6	3	8	13	—	4·9	10	1·12
SALISBURY (Wilton House), T. Challis, Esq.	186	July	29·818	0·628	89·0	42·0	47·0	77·1	50·9	26·2	63·1	58·3	·489	5·4	1·0	85	527	127·8	—	1·2	14	3	3	11	—	5·9	9	1·11
		Aug.	29·553	0·678	77·0	45·0	32·0	73·7	51·9	21·8	61·6	58·1	·485	5·4	0·8	89	524	123·5	—	1·5	6	5	10	10	—	6·9	17	4·83
		Sept.	29·807	0·810	79·0	31·0	48·0	67·0	43·9	23·1	55·8	50·4	·367	4·1	0·9	83	535	109·3	—	1·2	9	6	5	16	—	5·7	12	1·60
BARNSTAPLE (Devon), William Knile, Esq.	43	July	30·013	0·640	87·0	51·0	36·0	74·0	59·4	15·2	65·3	56·6	·459	5·1	1·8	74	528	—	—	1·2	5	9	3	14	—	2·5	11	1·70
		Aug.	29·691	0·840	77·0	51·0	26·0	73·3	59·5	13·8	62·9	56·4	·457	5·0	1·3	80	525	—	—	1·3	3	5	13	10	—	3·7	19	5·62
		Sept.	29·958	0·790	78·0	46·0	32·0	66·6	54·8	11·8	59·4	54·5	·425	4·8	0·9	85	531	—	—	1·3	4	2	9	15	—	3·5	16	4·03
BATH (St. Gregory's College, Downside, Somerset). Rev. F. A. Gasquet, O.S.B.	396	July	29·414	0·682	81·8	46·0	35·8	70·0	55·6	14·4	60·6	56·1	·451	5·0	0·9	88	522	129·9	48·7	1·1	9	6	7	9	—	4·6	11	2·03
		Aug.	29·112	0·878	74·0	48·7	25·3	67·7	54·4	13·3	59·4	54·9	·481	4·8	0·8	86	518	—	50·6	1·7	6	6	8	11	—	7·0	22	8·09
		Sept.	29·857	0·893	73·8	34·9	39·9	63·5	43·8	14·7	53·2	50·9	·373	4·2	0·7	89	536	—	44·8	1·5	5	1	5	19	—	5·4	15	3·03

eteorological Table, Quarter ending September 30th, 1878.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1878.	Pressure of Atmosphere in Month.			Temperature of Air in Month.					Mean Temperature.		Vapour.			Mean Degree of Humidity. Mean = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer.		Wind.				Mean Amount of Ozone.	Mean Amount of Cloud.	Rain.	
							Mean							In a Cubic foot of Air.						Relative Proportion of							
		Months.	Mean.	Range.	Highest.	Lowest.	Of all Highest.	Of all Lowest.	Daily Range.	Air.	Dew Point.	Mean.	Elastic Force.	Saturation. Short	Mean.			Maximum in Days of Sun.	Minimum on Grass.	N.	E.	S.	W.			Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	grs.	in.	gr.	grs.		grs.	°	°								in.
CATERHAM (Surrey), JAMES ADAM, Esq., M.D.	460	July	29·808	0·650	84·0	43·0	70·1	52·9	17·2	60·9	54·2	4·7	·421	1·3	79	531	4·7	49·6	2·4	13	4	8	6	3·3	8	1·03
		Aug.	29·988	0·750	77·0	43·0	68·0	53·0	15·0	60·3	54·9	4·9	·432	1·0	83	517	4·9	49·9	3·6	6	8	11	6	3·7	18	4·80
		Sept.	29·903	0·780	71·0	38·0	65·1	48·7	14·4	53·8	50·4	4·1	·367	0·9	83	526	4·1	44·6	2·8	10	3	13	4	3·3	10	1·60
RAMSGATE (Kent), Rev. E. DOUGLAS O'GARA, O.S.B.	108	July	29·926	0·664	82·0	39·4	69·3	50·0	19·3	61·5	55·0	4·8	·432	1·3	79	531	4·9	49·1	1·1	9	8	6	8	6·4	6	0·56
		Aug.	29·971	0·949	76·0	42·6	68·0	51·6	16·4	62·4	55·4	4·9	·432	1·4	78	520	4·9	48·9	1·4	5	10	7	13	6·9	17	3·41
		Sept.	29·901	0·858	73·0	39·2	67·6	51·5	12·1	57·4	51·1	4·2	·375	1·1	80	535	4·2	44·6	1·2	6	5	7	13	4·9	13	2·04
STRATHFIELD TURGISS (Hants), Rev. C. H. GRIFFITH, M.A., F.M.S.	197	July	29·898	0·684	85·5	42·5	74·6	52·0	22·6	63·0	55·0	5·0	·433	1·4	75	520	5·0	52·0	0·7	7	4	7	11	7·3	7	0·95
		Aug.	29·929	0·982	77·2	45·8	71·3	55·8	14·5	62·3	55·8	4·9	·446	1·2	80	534	4·9	52·9	0·8	11	2	5	12	7·1	18	4·35
		Sept.	29·795	0·813	73·6	31·8	66·0	46·4	19·6	55·3	50·8	4·2	·372	0·8	82	535	4·2	41·2	0·6	5	3	17	5	5·0	8	0·75
WEYBRIDGE HEATH (Surrey), WILLIAM F. HARRISON, Esq., F.M.S.	150	Sept.	29·848	0·780	75·0	32·3	65·6	46·6	19·6	55·7	49·9	4·1	·361	1·0	82	535	4·1	44·2	0·7	3	2	15	10	6·5	9	0·79
MARLBOROUGH, The Green (Wilts), Rev. THOMAS A. PRESTON, M.A., F.M.S.	474	July	29·855	0·666	83·0	41·7	71·8	53·3	18·5	61·0	55·2	4·9	·426	1·1	81	525	4·9	52·0	1·3	13	7	6	10	6·3	10	0·71
		Aug.	29·952	0·904	74·6	43·0	70·4	54·7	15·7	62·6	55·6	5·0	·441	0·9	84	520	5·0	52·1	0·8	5	8	11	6	6·5	19	4·33
		Sept.	29·490	0·806	73·4	32·7	65·6	46·7	18·9	55·6	49·8	4·0	·358	0·9	82	528	4·0	41·5	0·7	7	6	13	4	5·0	7	1·10
BLACKHEATH (London), JAMES GLAISHER, Esq., F.R.S.	180	July	29·838	0·708	87·5	44·3	73·7	55·2	18·5	62·0	55·0	4·8	·434	1·3	75	528	4·8	52·3	0·6	7	6	7	10	6·4	10	0·98
		Aug.	29·983	0·958	77·8	49·8	71·1	55·4	15·3	62·8	55·6	4·9	·435	1·1	79	521	4·9	52·2	0·8	11	2	7	11	6·4	17	6·27
		Sept.	29·890	0·851	73·6	37·8	66·3	49·3	17·0	56·6	50·4	4·1	·367	1·0	83	534	4·1	44·9	0·8	3	2	15	10	5·8	10	0·90
STREATLEY VICARAGE (Berks), Rev. J. SLATER, M.A., F.R.S., F.M.S.	180	July	29·881	0·677	86·5	44·2	73·2	54·4	19·0	62·6	55·9	5·0	·440	1·4	79	523	5·0	52·8	1·5	13	7	9	10	7·1	9	0·71
		Aug.	29·934	0·905	74·6	43·0	69·0	51·7	17·3	60·1	54·7	4·7	·414	1·0	84	520	4·7	51·3	1·3	7	6	13	12	6·5	12	4·31
		Sept.	29·836	0·780	73·4	33·0	65·0	46·7	18·3	55·6	50·5	4·1	·363	1·1	79	534	4·1	43·9	1·0	5	3	12	10	5·8	6	1·10
CHISWICK (Middlesex), W. P. THOMSON, Esq.	37	July	29·902	—	87·0	45·0	76·0	52·2	23·8	63·0	55·0	5·0	·433	1·3	78	526	5·0	52·0	0·7	7	5	6	11	7·3	6	0·91
		Aug.	29·954	0·892	78·0	45·0	72·5	54·7	18·1	62·0	55·0	5·0	·433	1·3	78	526	5·0	52·0	0·8	11	2	5	13	7·3	16	5·01
		Sept.	29·905	0·810	73·5	33·0	66·3	45·5	20·8	55·3	50·3	4·2	·370	1·0	82	535	4·2	43·9	0·8	3	2	15	10	6·3	6	0·72
CAMDEN SQUARE (London), G. J. SYMONS, Esq., F.R.S., F.M.S.	123	July	29·913	0·691	86·0	43·5	73·5	55·2	18·3	62·5	55·9	5·0	·438	1·3	79	524	5·0	52·8	1·5	12	7	6	10	7·3	7	0·84
		Aug.	29·989	0·972	77·0	50·0	70·4	55·8	15·6	62·6	55·9	5·0	·438	1·0	84	520	5·0	52·8	1·3	11	4	5	11	7·3	21	6·72
		Sept.	29·907	0·874	73·4	33·7	66·7	49·1	17·6	57·0	50·9	4·2	·371	1·0	80	535	4·2	44·8	0·8	3	2	15	10	6·3	12	0·83
OXFORD OBSERVATORY, Professor PRITCHARD.	210	July	29·882	0·646	84·3	46·7	72·0	54·7	17·3	62·3	55·1	5·0	·433	1·4	74	526	5·0	52·1	0·9	7	2	12	9	7·1	7	1·13
		Aug.	29·930	0·881	73·7	49·8	71·1	54·0	17·1	62·3	55·1	4·9	·435	1·4	74	520	4·9	52·3	1·1	4	4	5	18	6·9	19	3·12
		Sept.	29·781	0·791	73·2	35·4	64·6	49·1	15·5	56·9	51·4	4·3	·375	0·9	84	535	4·3	44·8	0·7	3	3	15	9	6·9	11	1·35
GLOUCESTER ASYLUM, E. TOLLER, Esq., M.D.	100	July	29·957	0·668	87·5	47·0	75·8	52·4	22·9	62·6	57·8	5·0	·440	1·0	86	525	5·0	52·6	0·5	12	8	6	8	6·9	9	2·07
		Aug.	29·952	0·903	79·0	47·0	73·9	53·2	20·7	62·5	57·5	5·0	·433	0·9	84	525	5·0	52·6	0·8	5	8	11	6	7·1	18	4·39
		Sept.	29·888	0·780	77·0	44·0	69·1	46·9	21·2	57·4	51·3	4·3	·376	1·1	80	534	4·3	46·4	1·1	3	3	17	11	6·5	11	2·95
ROYSTON (Hertfordshire), HALE WORTHAM, Esq., F.R.A.S., F.M.S.	269	July	29·775	0·705	86·3	43·0	74·8	53·4	21·4	63·4	55·9	4·6	·416	1·1	77	528	4·6	52·4	1·1	11	5	5	10	6·3	6	0·31
		Aug.	29·491	0·965	74·3	43·3	72·6	53·3	19·3	62·6	55·9	4·7	·421	1·3	74	523	4·7	51·3	1·3	10	5	7	11	6·9	22	4·39
		Sept.	29·716	0·858	70·0	37·2	65·8	46·0	19·9	55·8	49·5	4·0	·358	1·0	80	533	4·0	43·6	0·7	7	2	11	11	5·6	11	0·79
CARDINGTON (near Bedford), Mr. J. MACLAREN, Assistant to S. C. WHITBREAD, Esq., F.R.S.	103	July	29·923	0·690	86·4	44·2	73·2	55·1	20·1	62·6	55·0	4·8	·432	1·3	76	526	4·8	52·3	0·7	11	3	6	11	6·5	19	5·00
		Aug.	29·985	1·060	77·6	46·4	71·9	54·1	17·8	61·6	55·7	4·9	·435	0·8	87	525	4·9	52·3	0·8	3	5	8	15	6·9	19	4·00
		Sept.	29·862	0·830	74·6	35·6	66·0	47·1	18·6	57·0	52·2	4·3	·405	0·7	87	534	4·3	44·2	1·2	5	3	13	9	6·5	12	0·90
CAMBRIDGE (Trinity College), J. W. L. GLAISHER, Esq., M.A., F.R.S.	40	July	29·983	0·702	88·4	40·3	74·9	52·6	22·3	63·3	54·4	4·7	·424	1·3	79	532	4·7	52·0	1·0	8	4	6	10	6·5	8	0·71
		Aug.	29·978	1·074	81·0	41·1	76·4	53·7	22·7	63·2	55·9	4·9	·430	1·4	79	523	4·9	52·2	1·2	4	6	11	9	6·9	15	4·61
		Sept.	29·902	0·843	77·1	34·0	67·3	48·9	19·1	56·9	51·5	4·1	·361	0·9	83	535	4·1	43·7	1·2	3	2	10	12	6·5	6	0·90
STOCKTON RECTORY, near Rugby (Warwickshire).		July	29·728	0·656	80·0	40·0	73·0	51·1	21·9	61·0	56·9	5·1	·461	0·9	87	533	5·1	52·3	0·4	9	6	7	9	7·2	9	0·91
		Aug.	29·931	0·974	79·1	44·0	73·1	52·2	19·9	60·9	56·6	5·2	·459	0·6	89	525	5·2	52·6	0·5	7	7	11	6	7·0	21	8·46

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1878. Months.	Pressure of Atmosphere in Month. Mean.	Mean.	Highest.	Lowest.	Temperature of Air in Month. Mean. Range.	Mean. Of all Highest.	Mean. Of all Lowest.	Mean. Daily Range.	Mean Temperature. Air.	Dew Point.	Vapour. Elastic Force.	Mean.	In a cubic foot of Air. Amount of Saturation.	Mean Degree of Humidity. Sat^{n}. = 100.	Mean Weight of a cubic foot of Air.	Maximum in Bags of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Estimated Strength.	Wind. Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Number of Days it fell.	Rain. Amount fell.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	grs.		grs.		°									in.
SOMERLEYTON RECTORY (Suffolk). Rev. C. J. STEWARD, F.M.S.	50	July	29·928	29·858	84·5	41·8	42·7	77·9	48·7	29·2	60·0	53·6	...	...	...	...	...	...	...	0·79	9	10	4	8	5·9	7·4	8	1·05
		Aug.	29·865	29·802	79·1	44·0	35·1	73·1	48·4	24·7	61·6	56·4	...	...	...	...	...	...	...	0·79	3	14	7	6	6·5	6·4	16	4·73
		Sept.	29·845	29·784	78·0	38·4	39·6	69·3	43·0	26·3	56·3	51·3	...	...	...	...	...	...	...	1·11	5	14	5	10	5·6	6·0	15	3·20
NORWICH (Norfolk). JOHN QUESTED, Esq., JUN.	42	July	29·962	29·892	83·5	46·0	37·5	76·6	50·1	26·6	61·8	56·9	—	—	—	—	531	...	...	...	11	4	2	14	...	...	6	0·51
		Aug.																			3	12	10	15			13	6·85
		Sept.	29·905	29·836	79·2	45·0	32·2	64·7	51·3	13·4	59·9	52·9	.901	.775	86·1	81·6	535	...	...	...	3	12	10	15	...	...	13	2·32
WROTTESLEY, WOLVERHAMPTON (Stafford). E. SIMPSON, Esq.	500	July	29·961	29·898	86·0	46·3	39·7	77·3	52·4	24·9	62·4	57·4	.394	.254	74·4	77·3	525	1284	45·2	1·7	12	6	1	10	7·4	7·8	22	0·61
		Aug.	29·872	29·808	84·5	46·0	38·5	75·1	52·8	22·3	62·8	58·4	.410	.270	77·1	82·0	520	1233	49·0	1·8	6	9	4	13	7·4	7·8	14	2·75
		Sept.	29·824	29·760	77·0	43·0	34·0	62·4	48·0	14·4	59·3	54·3	.361	.229	74·0	81·0	519	1043	43·3	1·9	3	5	2	14	6·4	6·9	9	2·05
LEICESTER (Town Museum). W. J. HARRISON, Esq., F.G.S.	345	July	29·970	29·898	84·0	47·1	36·9	74·5	52·5	21·3	62·5	57·4	.396	.264	74·4	78·6	526	1284	46·3	0·7	10	6	3	10	6·4	7·0	11	2·00
		Aug.	29·878	29·814	79·5	46·1	33·4	66·4	52·3	20·1	62·4	57·3	.393	.263	76·5	81·3	523	1233	48·4	1·7	6	8	2	15	6·5	6·9	15	1·79
		Sept.	29·825	29·844	76·0	42·6	33·4	62·2	48·2	14·0	59·0	54·2	.370	.239	77·0	83·0	519	1076	43·8	1·8	1	7	1	16	6·5	6·9	10	1·63
NOTTINGHAM (Notts). M. O. TAIBOTTOIS, Esq., C.E., F.G.S., F.M.S.	183	July	29·936	29·871	86·4	49·7	36·7	77·1	52·9	24·2	63·0	58·0	.414	.277	77·1	81·0	529	1330	49·0	0·8	9	3	2	9	7·1	7·1	11	2·11
		Aug.	29·865	29·805	79·5	47·0	32·5	66·1	52·5	20·0	62·3	57·2	.393	.263	76·5	81·3	523	1233	48·0	1·9	3	14	4	8	6·7	6·7	17	3·87
		Sept.	29·842	29·785	77·0	43·0	34·0	62·7	48·7	14·0	59·4	54·4	.361	.229	74·0	81·0	519	1043	43·3	1·9	5	4	1	15	6·4	6·9	11	2·17
HOLKHAM (Norfolk). JOHN DAVIDSON, Esq., Assistant to the EARL of LEICESTER.	80	July	29·994	29·934	86·0	49·4	36·6	77·4	52·8	24·6	63·1	58·1	.414	.276	76·4	80·6	527	1284	46·2	1·7	6	9	2	14	6·9	7·4	9	0·17
		Aug.	29·905	29·844	79·5	46·0	33·5	66·0	52·0	20·0	62·2	57·2	.393	.263	76·5	81·3	523	1233	48·1	1·8	1	7	1	9	6·7	7·2	17	3·87
		Sept.	29·862	29·802	77·0	43·0	34·0	62·8	48·0	14·8	59·2	54·2	.370	.239	74·0	81·0	519	1043	43·3	1·9	3	5	1	14	6·4	6·9	11	2·17
LLANDUDNO (Carnarvonshire). JAMES NICOL, Esq., M.D., and THOMAS DALTON, Esq., M.D.	100	July	29·943	29·878	85·0	49·5	35·5	76·3	53·1	23·2	63·8	58·8	.421	.283	77·1	81·0	531	...	...	0·7	10	6	3	10	6·4	6·9	4	1·19
		Aug.	29·921	29·860	78·5	51·8	26·7	70·9	55·5	15·4	65·6	61·6	.450	.316	83·1	86·0	535	...	...	1·0	5	8	2	15	6·5	6·9	16	4·46
		Sept.	29·887	29·810	78·2	45·0	33·2	62·1	48·4	12·7	57·5	52·7	.370	.239	77·0	83·0	519	...	...	1·0	5	5	1	15	6·5	6·9	16	3·77
KELSTERN GRANGE, near Louth (Lincolnshire). D. GRANT BIRGGS, Esq., F.M.S.	350	July	29·991	29·924	84·0	49·6	34·4	76·5	53·8	22·7	63·5	58·5	.414	.276	76·4	80·6	527	1284	46·2	1·7	6	9	2	14	6·9	7·4	14	1·59
		Aug.	29·924	29·864	79·5	46·4	33·1	66·4	52·5	20·1	62·5	57·5	.393	.263	76·5	81·3	523	1233	48·3	1·8	3	9	3	16	6·7	7·2	20	3·92
		Sept.	29·912	29·845	77·0	43·0	34·0	62·8	48·0	14·8	59·4	54·4	.370	.239	74·0	81·0	519	1043	43·3	1·9	3	5	1	15	6·4	6·9	15	1·97
LIVERPOOL OBSERVATORY. JOHN HARTNUP, Esq., F.R.A.S.	197	July	29·936	29·874	85·5	51·1	34·4	77·2	55·3	22·9	65·3	60·3	.434	.302	77·1	81·0	531	...	...	0·9	10	6	3	10	6·4	6·9	5	1·16
		Aug.	29·910	29·848	79·5	51·8	27·7	71·9	55·9	16·2	65·8	61·8	.450	.316	83·1	86·0	535	...	...	1·0	5	8	2	15	6·5	6·9	16	4·10
		Sept.	29·868	29·808	77·0	46·0	31·0	62·9	48·1	14·8	59·2	54·2	.370	.239	74·0	81·0	519	1043	43·3	1·9	3	5	1	15	6·4	6·9	13	2·29
ECCLES (near Manchester). T. MACKERETH, Esq., F.M.S., F.R.A.S.	145	July	29·990	29·940	86·5	51·1	35·4	77·4	53·5	24·0	63·7	58·7	.433	.298	77·1	81·0	533	1284	46·8	0·6	12	6	3	9	7·1	7·1	9	1·26
		Aug.	29·927	29·868	79·5	49·0	32·9	67·0	52·1	21·3	63·0	58·0	.410	.276	76·4	81·3	523	1233	48·0	0·8	10	7	1	13	6·7	7·2	22	3·53
		Sept.	29·883	29·824	78·5	45·2	33·3	64·5	49·0	15·2	60·0	55·0	.385	.248	74·0	81·0	519	1076	44·0	0·8	4	10	1	15	6·4	6·9	14	2·61
BERMERSIDE OBSERVATORY, HALIFAX (Yorkshire). E. J. CROSSLEY, Esq., F.R.A.S.	320	July	29·970	29·906	86·2	47·6	38·6	77·8	51·3	26·5	61·2	56·2	.414	.276	77·1	81·0	531	1284	46·2	0·5	10	6	3	10	6·3	6·9	6	1·19
		Aug.	29·876	29·814	79·5	47·0	32·5	67·0	52·2	21·0	62·2	57·2	.393	.263	76·5	81·3	523	1233	48·4	0·6	4	10	2	14	6·7	7·0	18	3·79
		Sept.	29·853	29·793	78·0	43·0	34·0	62·9	48·1	14·8	59·0	54·0	.370	.239	74·0	81·0	519	1043	43·3	0·8	4	9	2	15	6·4	6·9	12	2·29
HULL (Yorkshire). Mr. E. PEASE.	12	July	29·965	29·906	86·0	48·0	38·0	77·9	53·4	25·0	63·0	58·0	.414	.276	77·1	81·0	531	...	...	0·8	10	6	3	10	6·4	6·9	7	0·68
		Aug.	29·713	29·733	79·5	45·0	34·5	65·6	52·6	19·1	62·1	57·1	.393	.263	76·5	81·3	523	1233	48·1	1·1	1	7	1	9	6·7	7·2	23	5·31
		Sept.	29·894	29·836	77·0	42·0	35·0	62·8	48·1	14·7	59·8	54·8	.370	.239	74·0	81·0	519	1043	43·3	0·8	3	5	1	14	6·4	6·9	14	2·61
STONYHURST (Lancashire). Rev. S. J. PERRY, F.R.S., F.R.A.S.	363	July	29·935	29·876	85·5	44·4	41·1	77·9	50·4	26·2	60·1	55·1	.389	.254	74·4	78·6	526	1284	46·1	1·2	10	6	3	10	6·4	6·9	17	1·31
		Aug.	29·895	29·838	78·0	46·1	31·9	66·8	52·7	20·1	62·7	57·7	.393	.263	76·5	81·3	523	1233	48·1	1·7	6	9	2	13	6·7	7·2	23	7·01
		Sept.	29·852	29·795	77·0	39·0	38·0	63·3	47·7	15·6	59·0	54·0	.370	.239	74·0	81·0	519	1043	43·3	1·8	3	5	1	13	6·4	6·9	18	2·99
LEEDS (Philosophical Hall) (Yorkshire). H. CROWTHER, Esq.	117	July	29·976	29·919	85·0	47·0	38·0	77·5	53·1	25·4	63·3	58·3	.414	.276	77·1	81·0	531	...	...	1·6	7	6	3	8	6·4	6·9	9	0·98
		Aug.	29·880	29·819	79·5	47·0	32·5	67·0	52·2	21·0	62·2	57·2	.393	.263	76·5	81·3	523	...	...	1·8	4	8	2	13	6·7	7·2	21	3·61
		Sept.	29·770	29·845	78·0	43·0	35·0	62·8	47·8	14·8	59·4	54·4	.370	.239	74·0	81·0	519	...	...	1·9	4	4	1	15	6·4	6·9	17	2·92
BRADFORD (Yorkshire). J. McLANDSBOROUGH, Esq., C.E., F.M.S.	500	July	29·965	29·758	86·0	44·6	41·4	77·6	52·6	25·2	62·6	57·6	.414	.276	77·1	81·0	531	...	...	1·9	8	6	3	8	6·4	6·9	9	1·05
		Aug.	29·912	29·851	79·5	46·0	33·5	66·8	52·8	20·0	62·8	57·8	.393	.263	76·5	81·3	523	...	...	1·9	4	8	2	13	6·7	7·2	22	3·80
		Sept.	29·913	29·853	78·0	38·2	39·8	63·2	48·4	14·9	59·4	54·4	.370	.239	74·0	81·0	519	...	...	1·9	4	4	1	15	6·4	6·9	19	2·99

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1878. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean Of all Highest.	Mean Of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Short of Saturation.	Mean Degree of Humidity. Satr. = 100.	Mean Weight of cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Minimum on Grass.	Wind. Estimated Strength.	Relative Proportion of N.	E.	S.	W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
COCKERMOUTH (Cumberland), H. Dodgson, Esq., M.D., F.R.A.S., F.M.S.	146	July	29·855	0·728	84·9	43·6	41·3	69·8	53·3	16·5	60·5	52·5	·395	4·4	1·5	75	531	115·7	46·0	0·3	8	3	6	14	1·1	6·4	9	0·67
		Aug.	29·538	1·026	79·8	44·3	35·5	68·7	53·8	14·9	60·9	52·8	·401	4·5	1·3	77	526	106·8	45·0	0·4	7	9	6	9	2·2	7·0	17	3·82
		Sept.	29·724	1·044	71·4	32·7	38·7	62·4	30·3	12·1	55·3	49·4	·354	4·0	1·0	81	534	95·8	42·4	0·6	6	4	12	8	2·9	7·1	21	5·86
ALLENHEADS (Northumberland), Mr. Joseph Charlton, Assistant to W. B. Beaumont, Esq., M.P.	1360	July	28·634	0·714	—	41·0	—	—	50·8	—	—	—	—	—	—	—	—	116·4	—	0·6	—	—	—	—	—	6·1	12	1·49
		Aug.	28·360	1·037	—	44·6	—	—	49·4	—	—	—	—	—	—	—	—	109·2	—	0·7	—	—	—	—	—	6·6	24	6·66
		Sept.	28·470	0·881	—	34·6	—	—	45·4	—	—	—	—	—	—	—	—	97·4	—	1·3	—	—	—	—	—	6·4	21	4·49
SILLOTH RECTORY (Cumberland), Rev. Francis Redford, M.A., F.R.A.S., F.M.S.	28	July	29·993	0·746	88·3	44·4	43·9	74·7	52·7	22·0	61·9	53·7	·414	4·6	1·6	75	531	109·5	49·4	1·4	4	10	9	8	5·2	3·8	5	0·67
		Aug.	29·669	1·023	78·6	45·4	33·2	71·4	52·5	18·9	60·0	53·3	·469	4·5	1·3	78	528	104·9	49·2	1·0	4	11	10	5	7·9	5·2	23	4·66
		Sept.	29·841	0·788	76·3	37·2	39·1	66·2	40·3	16·9	56·3	49·9	·361	4·0	1·0	79	535	99·7	46·2	1·9	6	6	6	12	7·6	4·8	21	3·97
CARLISLE (Cumberland), Isaac Cartmell, Esq., F.M.S.	114	July	29·684	0·696	82·4	40·0	42·4	71·8	51·0	20·8	60·5	51·7	·384	4·3	1·6	73	531	108·6	46·2	1·8	6	5	3	17	3·3	5·7	11	0·94
		Aug.	29·504	1·018	79·0	44·3	34·7	69·5	51·3	18·2	59·6	53·4	·469	4·6	0·8	81	527	99·8	44·5	1·9	6	7	6	12	5·6	6·7	23	4·60
		Sept.	29·748	1·052	74·5	35·0	39·5	64·0	47·4	16·6	54·7	48·6	·341	3·9	0·9	79	535	93·9	43·1	1·7	4	8	6	17	5·4	6·6	19	4·15
BYWELL (Northumberland), Mr. John Dawson, Assistant to W. B. Beaumont, Esq., M.P.	87	July	29·869	0·774	85·0	47·0	38·0	71·3	57·3	14·0	62·0	52·3	·394	4·3	1·9	71	530	112·1	51·7	1·3	9	10	3	9	—	3·9	10	0·50
		Aug.	29·598	1·031	75·0	42·0	33·0	68·0	55·2	12·8	59·2	54·1	·419	4·7	0·9	84	527	86·0	50·0	1·2	2	12	3	14	—	5·6	21	5·21
		Sept.	29·720	1·128	72·0	42·0	30·0	63·6	50·9	12·7	55·9	50·3	·366	4·1	0·9	82	533	82·1	45·2	1·4	7	6	5	12	—	4·8	16	1·79
NORTH SHIELDS (Northumberland), Robert Spence, Esq.	124	May	29·693	0·594	64·0	33·0	29·0	56·9	45·2	11·7	49·4	44·4	·293	3·4	0·7	84	539	—	42·7	1·3	10	7	4	10	—	7·0	20	1·95
		June	29·823	0·917	77·0	40·0	37·0	61·7	51·8	19·9	55·2	48·9	·347	3·9	1·0	80	536	—	49·1	1·1	9	4	6	11	—	5·1	14	1·62
		July	29·928	0·737	80·0	47·0	33·0	65·1	55·1	10·0	59·0	49·9	·350	4·1	1·5	72	534	—	52·9	1·2	5	9	9	8	—	4·8	7	0·13
		Aug.	29·657	0·980	69·5	44·0	25·5	62·9	54·3	8·6	57·7	52·6	·397	4·4	0·9	85	530	—	53·1	1·3	7	5	5	14	—	6·9	21	4·71
		Sept.	29·773	1·066	68·5	40·0	28·5	61·2	49·7	11·5	54·4	48·5	·340	3·9	0·9	80	536	—	48·4	1·6	8	3	5	14	—	5·7	14	1·68
WARINGSTOWN, CO. DOWN (Ireland), Thomas Waring, Esq.	191	July	29·781	0·628	81·0	41·0	44·0	72·1	52·3	19·8	60·0	51·9	·372	4·8	1·0	84	530	116·5	50·6	2·5	9	3	3	16	—	4·2	5	0·87
		Aug.	29·468	0·926	79·0	45·0	34·0	70·4	52·8	17·6	59·4	54·1	·429	4·7	1·0	84	525	107·8	49·5	2·7	5	9	7	10	—	4·9	19	3·52
		Sept.	29·631	0·908	73·0	38·0	35·0	64·9	49·9	15·0	55·8	52·2	·392	4·4	0·6	88	532	99·0	47·1	2·8	4	2	7	17	—	4·5	14	2·24

Second Rain-gauges are placed—

			July.		August.		September.		Total in Quarter.
At Strathfield Turgiss, at the height of	38 feet	*above the ground*,	the amount collected was	0·62 inches.	3·15 inches.		0·83 inches.		4·20 inches.
,, Oxford,	22 feet	,,	,,	1·09 ,,	5·01 ,,		1·27 ,,		7·37 ,,
,, Cardington,	36 feet	,,	,,	0·55 ,,	4·40 ,,		0·66 ,,		5·61 ,,
,, Eccles,	34 feet	,,	,,	1·28 ,,	5·08 ,,		3·81 ,,		10·17 ,,
,, Nottingham,	39 feet	,,	,,	1·62 ,,	6·12 ,,		2·01 ,,		9·75 ,,
,, Holkham,	4 feet	,,	,,	0·39 ,,	3·48 ,,		2·42 ,,		6·49 ,,

NOTE.—*Barometer Reading,* Leicester, 19th July, 9 h. p.m., 30·518 in., has been altered to 30·018 in.
,, Barnstaple, 16th Aug., 3h. p.m., 30·59 in., ,, 29·59 in.

Rainfall on Beachy Head, { At 515 feet above sea level. — July 1·03 inch. — August 3·39 inches. — September 1·84 inch. — Total 6·17 inches.
,, 495 ,, ,, — ,, 0·96 ,, — ,, 3·28 ,, — ,, 1·73 ,, — ,, 6·16 ,,

The mean averages of

The mean

Year 1878.	Pressure of Atmosphere in Month.	Temperature of Air in Month.			Mean Temperature.	Vapour.			Mean Degree of Humidity.	Wind.					Mean Amount of Ozone.	Mean Amount of Cloud.
		Highest.	Lowest.	Mean Range.	Point.	In a cubic foot of Air.	Elastic Force.	Saturation.	Scale 0 = Dry, Scale = 100.	Weight of Air.	Amount of Rain.	Relative Proportion of				
												N.	E.	S.	W.	
	in.	°	°	°	°	grs.	in.				in.					
1875	29·505	81·5	41·6	39·9	38·9	5·2	·353	16·0	59·3	1·405	4·75	1·2	6	8	7	10	3·5	5·9
1876	29·529	90·0	40·1	49·9	70·0	5·2	·340	17·8	59·8	1·324	4·75	1·4	7	6	5	12	4·0	5·1
1877	29·358	79·4	35·7	43·7	66·2	5·0	·334	15·9	57·1	1·309	4·12	1·0	6	4	7	13	4·1	6·3
1878	29·505	85·4	37·5	47·9	69·0	5·2	·356	16·4	59·9	1·403	4·6	1·2	6	6	7	12	3·5	5·9

QUARTERLY METEOROLOGICAL TABLE for different PARALLELS of LATITUDE.

...atures of the air were at Leeds, 92°·0; Bermerside, 90°·2; Bradford, 89°·6; and Streatley and Eccles, both 8
...ures of the air were at Salisbury, 81°·0; Strathfield, 31°·8; Stockton, 32°·5; and Marlborough and Cock
...ranges of the temperatures of the air were at Salisbury, 23°·7; Gloucester, 21°·6; Cambridge, 20°·7; and
...ures of the temperature of the air were at Guernsey, 9°·2; North Shields, 10°·1; and Liverpool, 10°·5.
...er of rainy days were at Allenheads, 37; Nottingham and Stonyhurst, both 36; and Kelston 35.
...of rainy days were at Osborne and Strathfield, both 34; Bournemouth, 34; and Guernsey, Caterham, and Rams
...of rain were at Stonyhurst, 11·43 inches; Bath, 13·06 inches; and Allenheads, 13·64 inches.
...rain were at Cambridge 5·20 inches; Royston, 5·51 inches; and Strathfield, 6·05 inches.

METEOROLOGY OF ENGLAND,

DURING THE QUARTER ENDING DECEMBER 31, 1878.

REMARKS ON THE WEATHER DURING THE QUARTER ENDING DECEMBER 31ST, 1878.

By JAMES GLAISHER, ESQ., F.R.S., *&c.*

THE weather was generally fine and warm till the 21st of October, the average daily excess of temperature up to this day being 3°·4, from the 22nd day the weather became cold and the sky cloudy, with rain falling frequently; this unpleasant weather continued throughout November and during the first few days in December. On the 6th of December the cold increased in intensity, severe frosts set in, and very low temperatures without intermission continued till the evening of the 25th of December; the average deficiency of daily temperatures below their averages for the 65 days ending December 25th was 5°·6; between December 6th and December 25th, on several days the mean temperature was more than 12° below its average, and on the 24th day it was as large as 17½° below; the average daily deficiency of mean temperature for the 20 days ending December 25th was 10°·8. On December 26th, the weather suddenly changed and became much warmer; the mean temperature of both December 30th and 31st was about 14° in excess of the average, being 31° to 32° higher than that of six days before; viz., on December 24th.

The cold winterly weather in December was general over the country, and on some of the days the temperature was extremely low. The following table shows the minimum temperatures at the several stations on the coldest days, and also on the two warm days at the end of the year.

TABLE showing the MINIMUM TEMPERATURES of the AIR at the several STATIONS on December 9th, 10th, 11th, 12th, 13th, 14th, 15th, 17th, 23rd, 24th, 25th, 30th, and 31st.

Names of Stations.	DECEMBER.												
	9th.	10th.	11th.	12th.	13th.	14th.	15th.	17th.	23rd.	24th.	25th.	30th.	31st.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Guernsey	33·0	31·0	28·5	29·0	28·0	31·5	31·5	34·0	33·5	31·0	33·0	45·0	49·5
Helston	24·0	21·0	20·0	22·0	22·0	22·0	25·0	26·0	26·0	30·0	36·0	50·0	45·0
Truro	23·0	25·0	13·0	14·0	22·0	31·0	20·0	25·0	26·0	24·0	28·0	46·0	52·0
Plymouth	26·0	26·0	23·0	20·5	22·0	29·0	19·0	27·5	25·0	25·5	28·0	40·0	50·0
Torquay	24·8	24·1	20·6	24·3	23·1	23·9	20·6	24·0	26·2	27·8	31·1	47·0	48·3
Ventnor	29·2	26·6	25·7	27·4	28·0	29·3	23·7	26·6	31·2	23·9	27·8	43·3	48·0
Osborne	26·4	23·3	23·8	26·8	25·7	25·8	20·7	24·9	25·6	21·3	24·7	37·5	47·9
Bournemouth	20·5	23·0	24·8	27·3	27·0	27·2	22·3	26·0	28·8	22·1	26·7	41·0	47·4
Brighton	20·6	24·5	24·0	26·0	24·5	25·0	21·0	25·1	24·9	23·6	23·4	44·2	46·3
Salisbury	21·0	17·0	23·0	24·0	24·0	18·0	18·0	22·0	18·0	16·0	16·0	33·0	49·0
Barnstaple	27·0	17·0	14·0	15·0	23·0	28·0	17·0	26·0	27·0	23·0	23·0	41·0	52·0
Caterham	26·0	24·0	24·0	23·0	24·0	24·0	23·0	21·0	24·5	19·0	19·0	30·0	42·0
Bath	22·3	16·7	23·0	22·3	22·5	22·2	20·8	20·4	21·7	19·6	14·8	44·6	46·8
Ramsgate	29·4	26·3	26·1	25·8	25·6	29·0	21·1	25·7	21·6	19·4	19·1	43·4	48·7
Strathfield Turgiss	26·1	19·3	25·3	26·9	24·4	15·0	22·6	19·9	15·6	10·5	9·0	45·5	47·5
Weybridge Heath	25·5	21·0	27·5	24·5	19·0	14·3	18·5	21·5	19·0	15·3	9·0	44·3	48·0
Marlborough	23·7	20·2	25·2	23·1	22·0	21·3	21·1	23·0	19·8	14·8	14·0	44·2	45·2
Bristol	22·0	19·8	24·0	27·1	24·8	22·9	15·0	20·6	26·8	19·0	19·7	39·8	49·2
Blackheath	27·9	23·0	25·9	25·7	20·4	19·2	22·0	25·4	21·1	17·0	15·9	44·1	48·8
Royal Observatory	27·6	25·4	26·0	25·5	20·6	20·5	21·3	23·1	19·8	13·4	12·2	44·4	47·8
Streatley	28·5	21·0	25·2	26·2	26·0	24·2	24·0	22·0	27·3	15·2	6·2	39·0	50·2
Camden Square	29·0	26·2	26·0	27·0	23·5	21·2	21·7	23·2	21·6	20·7	18·7	38·2	50·0
Oxford	23·3	22·1	25·8	21·5	16·9	21·5	24·1	25·2	12·1	5·1	26·6	49·0	43·1
Royston	27·1	18·3	23·1	24·7	21·0	14·2	18·6	21·4	21·0	21·7	15·5	37·0	46·9
Cardington	25·6	21·0	23·0	23·4	23·6	17·4	21·0	21·0	19·4	17·6	12·0	37·0	47·6
Somerleyton	26·9	18·8	18·3	21·0	14·6	18·3	15·7	14·8	19·6	22·2	11·8	34·6	47·7
Lowestoft	26·7	20·5	25·8	22·2	18·8	23·7	16·8	16·7	22·1	19·2	15·8	40·5	42·5
Cambridge	28·2	20·5	23·8	24·8	21·0	16·5	19·0	22·0	22·3	22·0	12·5	38·0	48·0
Stockton	21·5	12·0	12·5	11·0	21·0	17·0	22·0	18·5	21·0	10·0	5·0	37·0	46·0
Norwich	25·0	19·5	25·5	22·0	22·0	21·0	19·0	18·5	23·0	21·0	16·0	42·0	48·0
Leicester	24·9	19·3	24·4	22·3	20·8	18·0	23·9	19·0	23·0	15·0	6·9	40·2	47·0
Wolverhampton	21·4	16·6	18·3	17·5	20·7	21·4	22·4	19·9	21·4	13·6	10·6	32·5	44·1
Nottingham	20·9	18·0	19·4	19·8	21·1	21·3	15·5	16·3	21·9	12·9	5·2	31·9	43·9
Llandudno	30·5	23·7	22·3	26·0	20·7	21·0	31·2	24·4	29·4	23·5	23·2	40·6	42·1
Sheffield	29·0	24·0	27·0	24·0	17·0	18·5	23·0	27·5	25·5	25·0	14·7	35·5	45·0
Kelstern Grange	23·2	13·8	22·2	12·9	18·8	11·9	12·8	17·0	16·2	13·9	13·1	36·0	43·5
Liverpool	30·0	25·3	25·7	23·3	22·8	22·6	22·8	23·8	30·5	22·5	12·7	35·0	46·9
Bolton	21·0	19·0	24·0	16·0	13·0	15·6	17·3	17·5	15·0	12·5	13·5	32·0	32·0
Bermerside	28·2	28·5	21·7	22·0	19·0	17·0	21·0	24·5	20·0	—	12·0	32·0	44·2
Hull	22·0	18·0	22·0	16·0	19·0	18·0	13·0	19·0	19·0	20·0	9·0	32·0	43·0
Stonyhurst	23·9	20·3	18·0	14·5	14·8	17·0	29·8	17·1	14·0	13·1	17·5	40·0	34·6
Bradford	27·6	27·4	24·6	24·0	17·2	16·2	17·4	21·0	21·0	23·4	14·0	34·6	45·8
Leeds	27·0	24·0	27·0	23·0	18·0	16·0	23·0	25·0	22·0	23·0	14·0	34·0	41·0
Cockermouth	17·7	17·9	14·9	16·8	12·8	5·7	14·9	10·2	11·4	11·3	14·3	34·0	45·3
Allenheads	23·0	24·3	24·2	11·3	17·0	8·0	—	14·0	11·0	11·0	—	31·3	37·8
Silloth	21·0	21·3	10·7	14·4	15·3	9·4	20·0	12·0	16·7	14·4	13·0	34·7	43·0
Sunderland	30·0	23·0	29·0	28·0	20·0	13·0	18·0	29·0	24·0	25·0	23·0	35·0	42·0
Carlisle	22·0	13·0	13·0	10·5	5·5	16·8	11·0	7·2	5·0	5·8	16·5	41·0	30·0
Bywell	24·0	27·0	27·0	22·0	11·0	7·0	17·0	22·0	16·0	12·0	7·0	31·0	40·0
North Shields	27·0	25·0	27·6	21·5	12·5	9·0	22·0	21·5	18·2	14·0	21·3	34·0	39·0
Waringstown	16·0	13·0	16·0	7·0	14·0	10·0	6·0	31·0	5·0	—	14·0	43·0	28·0

From this table it will be seen that on the 9th the lowest reading was 16°·0 at Waringstown, on the 10th was 12°·0 at Stockton, on the 11th was 10°·7 at Silloth, on the 12th was 7°·0 at Waringstown, on the 13th was 5°·5 at Carlisle, on the 14th was 5°·7 at Cockermouth, on the 15th was 6°·0 at Waringstown, on the 17th was 7°·2 at Carlisle, on the 23rd was 5°·0 at Carlisle and Waringstown, on the 24th was 5°·1 at Oxford, and on the 25th was 5°·0 at Stockton. And from the numbers in the last two columns it will be seen that at many places the lowest temperature on December 30th and 31st was 50°, and at a few places even exceeded 50°.

Snow fell on 20 days in November, and on every day in December at some station, excepting the 4th, 29th, 30th, and 31st. On some days the fall was general; even in Cornwall and Devonshire it fell frequently in the month of December.

Fog or mist was very prevalent throughout the quarter, particularly in December when it appeared at some place on 29 days in the month, on some days the rime on trees was very beautiful, and at times continued for two or three days together.

The readings of the barometer in the neighbourhood of London were above their averages from the 1st to the 5th of October, the mean amount for the five days being 0·30 in. in excess; they were below from the 6th to the 10th, the mean amount in defect being 0·32 in.; from the 11th to the 17th the readings were again above to the mean amount of 0·23 in.; from the 18th of October to the 17th of November the readings were *below* their averages (except on four days, viz., November 1st, 2nd, 3rd, and 9th, on which days they were a little in excess of the average); the mean amount of daily defect for the 31 days ending November 17th, was 0·32 in. From the 18th to the 23rd of November the barometer readings were above their averages to the mean amount of 0·29 in.; from the 24th to the 28th they were on the average 0·40 in. too low; from 28th of November to the 6th of December (with the exception of December 1st) the pressure was in excess averaging 0·10 in. daily; and from the 7th of December to the end of the year the readings of the barometer were all below their averages (with the exception of one day, viz., 24th, on which day the mean value was 0·31 in. in excess), on many days the amount in defect of the average was 0·5 in. and 0·6 in., and on the 18th and 19th it was 0·7 in.; the mean amount in defect of the average for the 25 days ending December 31st was 0·37 in.

The mean reading of the barometer for the month of October was 29·60 ins., being 0·10 in. below the average, and lower than any value back to 1872. The mean reading for November was 29·57 ins., being 0·17 in. below the average; it was 0·05 in. above the value in 1877. The mean reading for December was 29·55 ins., being 0·25 in. below the average, and 0·24 in. below the value in 1877, but 0·24 in. above that in 1876.

The highest reading of the barometer in the quarter was 30·30 ins. on November 19th, and the lowest reading was 28·86 ins. on October 26th, the extreme range of readings was 1·44 ins.

The atmospheric pressure in October was less than in September by 0·217 in., in November was less than in October by 0·031 in., and in December was less than in November by 0·025 in. (From the preceding 37 years' observations the *mean pressure* in October is 0·102 in. less than in September, that in November is 0·041 in. greater than in October, and that in December is 0·050 in. greater than in November.) The mean decrease of pressure from September to October *over the whole country* was nearly the same everywhere and averaged 0·223 in., the pressure from October to November at places South of latitude 52½° was − 0·008 in., between 52½° and 54° it was + 0·060 in., and North of 54° it was + 0·126 in. The decrease of pressure from November to December between latitude 51° and 53° was 0·045 in., and North of 53° was 0·091 in.

At Greenwich *the mean temperature* of October was lower than in September by 5°·2; that of November was lower than that in October by 11°·8, and that in December was lower than that in November by 6°·0. (From the preceding 37 years' observations the *mean temperature* of October is lower than that of September by 6°·9, that of November is lower than that of October by 6°·6, and that of December is lower than that of November by 3°·4.) The decrease of mean temperature from September to October from all stations was 5°·4; the decrease from October to November was nearly the same everywhere, and the general mean was 11°·7; the decrease from November to December South of latitude 51° was 4°·5, between 51° and 52° was 5°·6, between 52° and 53° was 7°·2, between 53° and 54° was 6°·1, and North of 54° was 9°·0.

The mean temperature of the air for October was 51°·5, being 1°·9 and 1°·3 above the averages of the preceding 107 years and 37 years respectively. It was 2°·9 *higher* than the value in 1877, and 1°·3 *below* that in 1876.

The mean temperature of the air for November was 39°·7, being 2°·6 and 3°·9 below the averages of the preceding 107 years and 37 years respectively. It was lower than any value back to 1871, when it was 37°·6, and with this exception it is 16 years (or back to 1862) since we have had so cold a November as in the present year. The value in 1862 was 39°·8.

The mean temperature of the air for December was 33°·7, being 5°·4 and 6°·5 below the averages of the preceding 107 years and 37 years respectively. The following are the only instances back to 1771 when the mean temperature of December was as low as that in 1878, viz.—33°·7.

In 1784	when it was	° 31·0	In 1840	when it was	° 33·3
„ 1788	„	29·0	„ 1844	„	33·0
„ 1796	„	30·4	„ 1846	„	32·9
„ 1798	„	33·7	„ 1870	„	33·6
„ 1799	„	32·8	„ 1874	„	33·2

The mean temperature of the air for the quarter was 41°·6, being 2°·0 and 3°·0 below the averages of the preceding 107 years and 37 years respectively.

The mean high day temperatures of the air were 4°·8 and 7°·7 below their averages in November and December, but 0°·6 above in October.

The mean low night temperatures of the air were 2°·4 and 6°·5 below their averages in November and December, but 1·4 *above* in October. Therefore the days and nights were cold in November and December (particularly so in the latter month), but somewhat warm in October.

The mean daily ranges of temperature were 0°·8, 2°·3, and 1°·0 respectively below their averages in October, November, and December.

The fall of rain at Greenwich in October was 1·7 in., being 1·1 in. *below* the average of 63 years. The fall in November was 3·5 ins., being 1·1 in. above the average, and the fall in December *was 1·2 in., being* 0·9 in. below the average. The total fall in the quarter was 6·4 ins., or *0·9 in. below* the average.

1878. Months.	Temperature of Air. Mean.	Diff. from average of 107 years.	Diff. from average of 37 years.	Evaporation. Mean.	Diff. from average of 37 years.	Dew Point. Mean.	Diff. from average of 37 years.	Air—Daily Range. Mean.	Diff. from average of 37 years.	Water of the Thames.	Elastic Force of Vapour. Mean.	Diff. from average of 37 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Diff. from average of 37 years.
	°	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
Oct. -	51·5	+1·9	+1·3	49·0	+0·9	46·4	+0·4	14·0	−0·8	55·2	0·317	+0·005	3·5	−0·1
Nov. -	39·7	−2·6	−3·9	38·2	−3·2	36·2	−3·3	9·3	−2·3	42·6	0·214	−0·033	2·5	−0·3
Dec. -	33·7	−5·4	−6·5	32·8	−5·9	31·2	−5·7	8·4	−1·0	35·9	0·175	−0·046	2·1	−0·5
Means -	41·6	−2·0	−3·0	40·0	−2·7	37·9	−2·9	10·6	−1·4	44·6	0·235	−0·025	2·7	−0·3

1878. Months.	Degree of Humidity. Mean.	Diff. from average of 37 years.	Reading of Barometer. Mean.	Diff. from average of 37 years.	Weight of a Cubic Foot of Air. Mean.	Diff. from average of 37 years.	Rain. Amount.	Diff. from average of 63 years.	Daily Horizontal movement of the Air.	Reading of Thermometer on Grass. Number of Nights it was: At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	Miles.				°	°
Oct. -	83	−4	29·602	−0·100	536	− 3	1·7	−1·1	259	2	16	13	27·9	53·1
Nov. -	88	0	29·571	−0·172	549	+ 1	3·5	+1·1	308	11	19	0	25·1	39·5
Dec. -	89	+1	29·546	−0·247	555	+ 3	1·2	−0·9	246	21	8	2	13·2	45·0
Means -	87	−1	29·573	−0·173	547	0	Sum 6·4	Sum −0·9	Mean 272	Sum 34	Sum 43	Sum 15	Lowest 13·2	Highest 53·1

NOTE.—In reading this table it will be borne in mind that the plus sign (+) signifies *above* the average, and that the minus sign (−) signifies *below* the average.

The average duration of the different directions of the wind referred to eight points of the compass, and the duration of each direction in each month in the quarter were as follows:—

Direction of Wind.	October. Average.	1878.	Departure from Average.	November. Average.	1878.	Departure from Average.	December. Average.	1878.	Departure from Average.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
N.W.	2	3	+1	2½	6	+3½	2	5	+3
N.	3	0	−3	3½	8	+4½	2¼	2	− ¼
N.E.	2½	1	−1½	3½	7	+3½	2	5	+3
E.	1½	6	+4½	2	2	0	1¾	2	+ ¼
S.E.	1½	3	+1½	2	1	−1	1¼	1	− ¾
S.	3½	5	+1½	3½	1	−2½	3	3	0
S.W.	0	7	−2	7½	1	−6½	9½	5	−4½
W.	4½	5	+ ½	2	3	+1	4	7	+3
Calm (nearly.)	3½	1	−2½	3½	1	−2½	4	1	−3

The plus sign (+) denotes excesses over averages; the largest numbers affected with this sign in the month of October are opposite to the E., in November to the N., N.W., and N.E., and in December to the N.W., N.E., and W.

The minus sign (−) denotes defects below averages; the largest numbers affected with this sign in the month of October are opposite to the N. and S.W., in November to the S. and S.W., and in December to the S.W.

Thunderstorms occurred on 7 days in October, 7 in November, and on 6 in December.

Thunder was heard but lightning was not seen on 2 days in October, and on 3 in November.

Lightning was seen but thunder was not heard on 10 days in October, 7 in November, and on 10 in December.

Solar halos were seen on 18 different days during the quarter.

Lunar halos were seen on 9 nights in October, 8 in November, and on 8 in December.

Snow fell on the 29th of October at Torquay, Oxford, Kelstern, Hull, and Allenheads; on the 30th at Torquay, Ramsgate, Royston, Cardington, Norwich, Stockton, Cambridge, and Allenheads; and on the 31st at Allenheads. Snow fell on 20 days in November at different places; and on 27 days in December.

Hail fell on 12 days in October, 17 days in November, and on 21 days in December. The falls of hail in November and December occurred principally in Devon and Cornwall.

Fog prevailed on 20 days in October; 17 days in November; and on 29 days in December; or on 66 days during the quarter. The prevalence of fog was pretty general all over the country during the quarter.

MONTHLY METEOROLOGICAL TABLE FOR THE QUARTER ENDING DECEMBER 31st, 1878.

The Observations have been reduced to Mean values by Glaisher's Barometrical and Diurnal Range Tables, and the Hygrometrical results have been deduced from the sixth edition of his Hygrometrical Tables.

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1878. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean Of all Highest.	Temperature of Air in Month. Mean Of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Short of Saturation.	Mean Degree of Humidity. Sat^{n}. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									
GUERNSEY, Samuel Elliott Hoskins, Esq., M.D., F.R.S., F.M.S.	204	Oct.	29·579	1·171	66·0	40·0	26·0	59·0	50·6	8·4	54·4	50·4	·364	4·1	0·7	86	532	—	—	1·7	6	7	9	9	3·0	4·5	16	3·94
		Nov.	29·550	1·117	55·0	36·0	19·0	48·4	40·7	7·7	44·6	39·4	·242	2·8	0·6	82	543	—	—	1·8	13	7	2	8	4·4	7·5	25	9·08
		Dec.	29·514	0·904	54·5	28·0	26·5	44·7	35·8	8·9	40·6	34·9	·203	2·4	0·6	81	547	—	—	1·7	9	6	6	10	4·0	7·0	28	5·11
HELSTON (Cornwall), Matthew P. Moyle, Esq., M.R.C.S.	106	Oct.	29·700	1·140	72·0	39·0	33·0	63·0	48·9	14·1	54·6	48·1	·335	3·8	1·0	78	534	73·8	41·2	1·8	8	7	8	8	4·8	3·1	17	2·41
		Nov.	29·754	1·100	58·0	30·0	28·0	50·8	37·6	13·0	43·8	36·2	·213	2·5	0·8	75	548	56·1	33·0	1·5	14	9	1	6	4·5	4·9	21	6·87
		Dec.	29·658	1·044	55·0	20·0	35·0	45·4	31·7	13·7	38·6	33·2	·190	2·3	0·5	85	552	55·1	27·5	1·3	12	7	6	6	7·2	5·5	14	4·89
TRURO (Cornwall), C. Barham, Esq., M.D., F.M.S.	43	Oct.	29·720	1·162	69·0	34·0	35·0	60·5	48·0	12·5	53·5	48·5	·340	3·8	0·8	83	536	—	—	2·9	6	5	11	9	—	6·4	19	5·32
		Nov.	29·810	1·100	54·0	26·0	28·0	48·6	37·3	11·3	42·3	37·6	·224	2·6	0·5	84	550	—	—	2·1	16	6	2	6	—	6·8	22	5·79
		Dec.	29·741	0·970	55·0	13·0	42·0	44·7	30·6	14·1	38·0	33·8	·194	2·2	0·5	85	554	—	—	1·7	14	4	4	9	—	6·5	19	6·17
PLYMOUTH (Devon), John Merrifield, Esq., F.R.A.S., F.M.S., LL.D.	69	Oct.	29·778	1·249	64·0	35·0	29·0	59·4	47·5	11·9	52·5	48·1	·337	3·8	0·7	85	538	—	46·3	1·6	6	8	8	9	—	5·5	21	3·64
		Nov.	29·818	1·104	53·5	29·5	24·0	47·1	35·2	11·9	40·7	36·9	·218	2·5	0·4	86	552	—	35·8	1·5	14	4	3	9	—	6·0	20	2·57
		Dec.	29·740	1·000	53·5	19·0	34·5	41·6	29·8	11·8	35·8	32·8	·188	2·1	0·3	89	557	—	28·8	1·2	13	5	5	8	—	5·1	17	3·57
BABBACOMBE, Torquay (Devon), Edwin E. Glyde, Esq., F.M.S.	305	Oct.	29·451	1·258	65·9	32·0	33·9	58·5	47·3	11·2	52·4	47·1	·324	3·6	0·8	82	532	109·9	40·6	1·7	4	6	8	13	4·1	6·3	17	3·46
		Nov.	29·471	1·146	52·9	31·0	21·9	46·1	37·0	9·1	41·2	36·7	·218	2·5	0·5	84	545	86·8	31·0	1·8	16	4	2	8	4·6	6·6	17	3·26
		Dec.	29·408	1·055	52·8	20·6	32·2	41·9	31·4	10·5	36·7	33·1	·188	2·2	0·8	86	549	76·1	24·4	1·4	10	5	5	11	2·7	6·6	18	3·21
VENTNOR (Royal National Hospital for Consumption), Isle of Wight, Hartley Sagar, Esq.	150	Oct.	29·695	1·320	73·8	34·2	39·6	62·6	50·6	12·0	55·1	50·2	·364	4·1	0·8	84	534	—	—	—	5	8	7	11	6·9	5·7	13	3·01
		Nov.	29·672	1·028	52·4	31·4	21·0	46·1	37·5	8·6	41·3	38·3	·252	2·7	0·4	90	549	—	—	—	12	10	2	6	5·0	6·5	19	4·09
		Dec.	29·648	1·028	50·7	24·1	26·6	42·0	32·5	9·5	37·1	34·5	·199	2·3	0·3	90	553	—	—	—	12	5	3	11	5·2	6·0	20	1·89
OSBORNE (Isle of Wight), R. J. Mann, Esq.	172	Oct.	29·589	1·300	73·4	35·2	38·2	60·3	47·4	12·9	52·5	48·7	·345	3·9	0·6	87	535	96·7	42·1	0·2	4	6	12	9	—	5·9	14	3·20
		Nov.	29·563	1·100	52·3	29·0	23·3	45·8	35·3	10·5	40·6	37·2	·222	2·6	0·3	90	548	63·5	30·4	0·3	15	5	3	7	—	7·3	18	2·32
		Dec.	29·538	1·062	52·1	21·7	30·4	40·5	30·5	10·2	35·9	33·4	·192	2·2	0·3	91	553	49·5	24·9	0·2	10	6	6	9	—	7·8	12	1·44
SOUTH BOURNE, near Bournemouth, (Hants), T. A. Compton, Esq., M.D., B.A., F.M.S.	128	Oct.	29·655	1·290	64·9	32·3	32·6	57·3	46·7	10·6	51·6	46·4	·316	3·5	0·8	82	537	—	—	—	9	7	5	10	—	4·5	12	2·16
		Nov.	29·650	1·160	52·1	31·0	21·1	45·2	35·6	9·6	40·2	35·6	·209	2·4	0·5	84	550	—	—	—	9	7	3	11	—	6·2	15	2·09
		Dec.	29·603	1·060	52·0	22·1	29·9	40·2	30·5	9·7	35·4	31·6	·178	2·1	0·4	86	554	—	—	—	10	7	3	11	—	5·5	11	1·07
BRIGHTON (Sussex), F. E. Sawyer, Esq., F.M.S.	206	Oct.	29·580	1·284	68·0	32·4	35·6	58·0	47·2	10·8	52·2	47·0	·323	3·7	0·8	83	535	—	43·0	1·0	9	6	8	8	—	6·8	13	3·64
		Nov.	29·523	1·177	52·7	30·4	22·3	44·5	36·1	8·4	40·2	36·1	·213	2·4	0·5	86	547	—	33·1	1·0	15	8	2	5	—	6·4	16	3·14
		Dec.	29·519	1·075	51·0	21·0	30·0	38·7	30·5	8·2	35·0	31·4	·176	2·1	0·3	86	553	—	27·2	0·8	14	5	4	8	—	6·4	15	1·94
SALISBURY (Wilton House), T. Challis, Esq.	186	Oct.	29·574	1·318	—	28·0	—	—	41·1	—	—	—	—	—	—	—	—	68·3	39·9	1·2	6	4	9	12	—	6·4	15	3·81
		Nov.	29·485	1·118	—	25·0	—	—	31·5	—	—	—	—	—	—	—	—	63·6	30·0	1·2	13	6	4	7	—	7·2	16	3·28
		Dec.	29·525	1·086	—	16·0	—	—	25·0	—	—	—	—	—	—	—	—	55·3	23·7	1·3	16	4	3	8	—	7·1	10	1·69
BARNSTAPLE (Devon), William Knile, Esq.	43	Oct.	29·713	1·210	72·0	36·0	36·0	60·8	48·0	11·9	54·0	49·4	·352	4·0	0·7	84	535	—	—	1·3	4	4	11	12	—	5·4	20	7·21
		Nov.	29·791	1·110	53·0	31·0	22·0	47·5	37·3	10·2	42·1	37·8	·278	2·6	0·5	86	550	—	—	1·2	18	6	3	9	—	4·0	17	4·64
		Dec.	29·704	1·070	56·0	14·0	42·0	42·0	29·3	12·7	35·9	33·6	·194	2·2	0·3	91	556	—	—	1·1	12	3	6	10	—	4·8	16	3·80
BATH (St. Gregory's College, Downside, Somerset). Rev. F. A. Gasquet, O.S.B.	596	Oct.	29·115	1·295	70·9	32·2	38·7	57·0	44·4	12·6	49·7	46·2	·313	3·6	0·5	88	529	—	39·2	1·8	5	5	9	12	—	5·5	15	6·55
		Nov.	29·130	1·130	51·2	27·7	24·2	42·1	33·9	8·2	37·5	34·6	·280	2·4	0·3	90	543	—	31·5	1·6	14	6	1	9	—	7·6	17	3·99
		Dec.	29·068	1·064	51·9	14·8	37·1	37·1	28·6	8·5	32·9	30·2	·168	1·9	0·3	90	547	—	23·2	1·6	8	4	7	12	—	6·0	13	2·46
CATERHAM (Surrey), James Adam, Esq., M.D.	608	Oct.	29·077	1·300	67·0	30·0	37·0	57·5	43·8	13·7	50·2	46·7	·319	3·6	0·5	88	528	—	39·1	3·4	7	3	10	11	—	3·8	10	2·81
		Nov.	29·022	1·200	50·0	28·0	22·0	42·6	33·0	9·6	38·2	35·8	·210	2·4	0·3	91	540	—	29·1	3·5	15	6	3	6	—	4·4	14	4·80
		Dec.	29·983	1·350	52·0	19·0	33·0	36·0	27·2	8·8	32·6	30·4	·170	2·0	0·2	91	546	—	21·4	3·6	10	7	5	9	—	5·4	14	1·95

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1878. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Lowest.	Range.	Mean of all Highest.	Mean of all Lowest.	Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a Cubic foot of Air. Mean.	Vapour. In a Cubic foot of Air. Amt. of Saturation.	Mean Degree of Humidity. Sat°. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
RAMSGATE (Kent), Rev. E. Douglas O'Gara, O.S.B.	108	Oct.	29·654	1·297	66·3	30·8	35·5	57·7	47·8	9·9	52·2	47·2	·325	3·7	0·7	83	536	91·1	—	1·4	4	5	11	11	—	6·6	15	3·87
		Nov.	29·609	1·348	50·2	28·4	21·8	45·5	37·7	7·8	41·7	37·6	·227	2·6	0·5	87	547	71·5	—	1·7	8	4	7	11	—	8·5	18	5·08
		Dec.	29·614	1·199	53·7	19·1	34·6	39·0	30·5	8·5	35·2	32·1	·182	2·1	0·3	88	555	66·2	26·5	1·3	6	5	5	15	—	7·3	19	2·59
STRATHFIELD TURGISS (Hants), Rev. C. H. Griffith, M.A., F.M.S.	197	Oct.	29·571	1·302	74·0	31·4	42·6	58·9	42·9	16·0	50·6	46·3	·315	3·6	0·5	86	536	99·2	37·4	0·6	3	6	10	12	1·8	3·2	13	2·80
		Nov.	29·560	1·164	52·9	25·1	27·8	44·7	33·9	10·8	39·1	35·4	·207	2·4	0·4	87	549	64·8	27·5	0·7	13	2	3	11	1·0	7·7	16	3·51
		Dec.	29·519	1·161	55·0	9·0	46·0	38·1	27·3	10·8	33·4	31·4	·176	2·1	0·1	91	555	57·1	21·3	0·5	7	4	8	12	1·2	7·5	13	1·49
WEYBRIDGE HEATH (Surrey), William F. Harrison, Esq., F.M.S.	150	Oct.	29·648	1·314	75·0	29·0	46·0	59·4	42·9	16·5	50·3	44·8	·297	3·4	0·7	82	538	86·7	38·2	0·8	7	6	15	5	3·8	5·7	15	2·33
		Nov.	29·632	1·269	52·0	27·5	24·5	43·6	34·0	9·6	38·8	36·6	·215	2·5	0·5	86	551	55·3	29·8	1·0	12	9	4	5	2·7	7·4	21	2·78
		Dec.	29·590	1·158	58·5	9·0	49·5	37·1	27·6	9·5	32·7	27·8	·152	1·8	0·4	82	557	41·9	23·0	0·8	10	6	9	6	1·7	7·1	14	1·41
MARLBOROUGH, The Green (Wilts), Rev. Thomas A. Preston, M.A., F.M.S.	474	Oct.	29·263	1·299	72·6	30·9	41·7	58·1	43·7	14·4	50·0	45·7	·307	3·5	0·6	85	531	97·5	37·7	0·4	3	7	12	9	—	6·7	16	3·84
		Nov.	29·239	1·160	52·0	25·0	27·0	43·6	33·3	10·3	37·9	34·8	·262	2·4	0·3	89	545	65·1	28·1	0·3	17	2	1	10	—	7·2	14	3·80
		Dec.	29·210	1·086	53·7	14·0	39·7	37·9	27·5	10·4	32·5	30·3	·179	2·0	0·2	91	550	53·7	23·7	0·4	13	2	4	12	—	6·9	11	1·89
BLACKHEATH (London), James Glaisher, Esq., F.R.S.	160	Oct.	29·607	1·323	74·0	30·9	43·1	59·2	45·2	14·0	51·5	46·1	·313	3·5	0·8	82	536	102·0	41·3	0·7	2	9	10	10	—	6·1	12	1·80
		Nov.	29·569	1·276	53·6	28·7	24·9	44·0	35·3	8·5	39·7	35·7	·209	2·4	0·5	84	549	63·7	32·3	0·9	14	7	3	6	—	7·7	15	3·53
		Dec.	29·542	1·160	56·2	15·9	40·3	37·5	28·7	8·8	33·8	31·0	·174	2·0	0·2	88	555	48·6	23·7	0·4	7	6	6	12	—	8·2	14	1·32
STREATLEY VICARAGE (Berks), Rev. J. Slatter, M.A., F.R.S., F.M.S.	150	Oct.	29·607	1·316	76·9	31·5	45·4	60·5	45·1	15·4	51·6	46·4	·316	3·5	0·8	82	536	—	—	1·6	7	7	7	10	—	5·7	15	3·04
		Nov.	—	—	52·0	25·8	26·2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	2·86
		Dec.	29·556	1·129	55·3	6·2	49·1	38·3	28·4	9·9	33·5	29·5	·163	1·9	0·4	85	556	—	—	0·9	11	7	5	8	—	8·9	15	1·54
CHISWICK (Middlesex), W. P. Thomson, Esq.	25	Oct.	29·687	1·380	75·5	29·0	46·5	60·8	42·8	18·0	—	—	—	—	—	—	—	89·0	—	0·8	2	7	12	10	—	6·7	10	1·84
CAMDEN SQUARE (London), G. J. Symons, Esq., F.R.S., F.M.S.	123	Oct.	29·646	1·132	73·3	31·6	41·7	59·4	45·3	14·1	51·4	46·5	·318	3·5	0·7	84	537	87·3	41·4	—	8	4	9	10	—	6·4	13	1·99
		Nov.	29·605	1·284	53·5	29·4	24·1	44·9	34·8	10·1	39·8	35·7	·209	2·4	0·5	86	549	61·2	31·9	—	19	1	4	6	—	7·3	17	2·95
		Dec.	29·581	1·216	55·2	15·7	36·5	38·2	29·5	8·7	34·1	31·3	·177	2·1	0·2	89	555	46·7	26·6	—	12	1	4	14	—	7·2	15	1·47
OXFORD OBSERVATORY, Professor Pritchard, M.A., F.R.S., F.R.A.S.	210	Oct.	29·540	1·296	70·0	32·1	37·9	57·4	45·2	12·2	51·0	45·3	·304	3·4	0·8	81	534	98·9	40·0	1·1	4	6	10	11	0·1	7·6	15	3·11
		Nov.	29·543	1·243	51·9	30·3	21·6	43·6	36·4	7·2	39·6	35·0	·204	2·5	0·5	84	548	64·1	31·7	1·0	14	3	4	9	0·4	8·2	16	2·28
		Dec.	29·503	1·134	53·7	5·6	48·1	37·6	28·5	9·3	32·9	30·9	·173	2·0	0·2	22	555	54·8	25·3	0·8	10	5	5	11	0·3	7·9	10	1·51
GLOUCESTER ASYLUM, E. Toller, Esq., M.D.	100	Oct.	29·654	1·272	76·0	27·0	49·0	60·2	43·7	16·5	51·5	48·5	·341	3·8	0·5	89	537	90·5	—	0·5	5	5	6	15	—	7·0	15	3·09
ROYSTON (Hertfordshire), Hale Wortham, Esq., F.R.A.S., F.M.S.	269	Oct.	29·498	1·284	70·0	28·3	41·7	58·1	42·9	15·2	49·9	43·5	·283	3·2	0·9	79	536	—	—	—	3	7	11	10	—	5·0	13	1·97
		Nov.	29·477	1·319	51·6	24·5	27·1	44·0	32·7	11·3	38·0	35·1	·206	2·4	0·3	90	549	—	—	—	15	3	4	9	—	8·3	16	3·84
		Dec.	29·421	1·169	53·1	13·2	39·9	36·2	26·5	9·7	31·8	29·3	·161	2·0	0·1	90	555	—	—	—	7	4	7	13	—	7·5	12	1·15
CARDINGTON (near Bedford), Mr. J. MacLaren, Assistant to S. C. Whitbread, Esq., F.R.S.	105	Oct.	29·650	1·324	70·6	29·6	41·0	57·6	43·1	14·5	50·1	47·4	·328	3·7	0·4	91	538	73·4	38·7	0·8	3	6	13	9	—	5·5	14	2·10
		Nov.	29·653	1·276	51·4	27·0	24·4	44·2	33·6	10·6	38·7	36·1	·214	2·5	0·3	92	552	49·3	29·4	1·2	17	4	2	7	—	7·6	17	3·50
		Dec.	29·615	1·150	53·4	12·0	41·4	36·6	26·9	9·7	32·1	30·5	·171	2·0	0·1	93	559	58·6	21·9	0·7	10	3	4	14	—	7·6	12	1·46
CAMBRIDGE (Trinity College), J. W. L. Glaisher, Esq., M.A., F.R.S.	40	Oct.	29·694	1·342	73·8	30·0	43·8	59·4	44·0	15·4	51·0	47·3	·328	3·7	0·5	87	538	101·9	36·7	1·1	5	4	12	10	—	5·7	15	1·92
		Nov.	29·677	1·250	53·5	21·8	31·7	44·1	34·4	9·7	39·0	36·0	·212	2·4	0·4	90	552	66·5	28·7	1·0	14	5	2	9	—	7·1	21	4·66
		Dec.	29·646	1·236	55·0	12·5	42·5	36·8	27·8	9·0	32·8	31·1	·175	1·9	0·2	94	558	52·3	24·3	0·8	8	4	7	12	—	6·8	17	1·09
STOCKTON RECTORY, near Rugby (Warwickshire), W. Tuckwell, Esq.	289	Oct.	29·409	1·254	72·5	27·0	45·5	57·7	42·8	14·9	49·8	46·1	·312	3·5	0·5	87	534	64·0	32·7	0·4	4	7	11	9	6·4	5·5	18	2·23
		Nov.	29·436	1·176	50·3	26·5	23·8	43·8	32·0	11·8	39·7	36·7	·216	2·6	0·3	90	546	47·3	30·2	0·8	14	3	2	11	1·5	6·5	13	2·57
		Dec.	29·384	1·034	52·0	5·0	47·0	36·3	24·3	12·0	31·7	30·0	·167	2·0	0·1	93	555	38·1	—	0·2	5	3	6	17	2·8	6·6	14	1·79
LOWESTOFT (Suffolk), S. H. Miller, Esq., F.R.A.S., F.M.S.	85	Oct.	29·617	1·354	64·8	29·0	35·8	54·9	46·8	10·1	51·5	44·6	·297	3·4	0·9	78	536	90·5	43·2	1·2	3	5	10	13	7·5	6·1	14	1·80
		Nov.	29·582	1·550	52·3	30·5	21·8	45·8	36·9	8·9	41·3	37·9	·221	2·6	0·5	85	547	68·6	33·9	0·9	11	6	2	11	7·8	8·1	20	6·34
		Dec.	29·576	1·300	54·2	15·8	38·4	37·6	27·6	10·0	32·9	29·9	·166	1·9	0·3	87	557	55·5	24·9	0·5	7	3	4	17	8·2	7·3	19	1·99

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1878.	Months.	Pressure of Atmosphere in Month.		Temperature of Air in Month.						Mean Temperature.	Vapour.			Mean Dezree of Humidity. Sat^{n}. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer.		Estimated Strength.	Wind.				Mean Amount of Ozone.	Mean Amount of Cloud.	Rain.	
				Mean.	Range.	Highest.	Lowest.	Range.	Mean		Daily Range.		Mean.	Elastic Force.	In a cubic foot of Air.	Short of Saturation.			Maximum in Rays of Sun.	Minimum on Grass.		N.	E.	S.	W.			Number of Days it fell.	Amount collected.
	feet.			in.	in.	°	°	°	°	°	°	°	grs.	in.	grs.		grs.	°	°									in.
SOMERLEYTON RECTORY (Suffolk), Rev. C. J. Stewart, F.M.S.	50	Oct.		29·714	1·350	68·9	26·0	42·9	44·9	51·1	48·7	48·0	3·9	·344	0·4	92	538	—	—	0·9	4	6	11	10	6·5	5·3	13	1·77
		Nov.		29·550	1·578	61·0	29·0	32·0	46·0	41·0	38·4	37·5	3·7	·293	0·3	91	549	—	—	1·1	13	5	5	8	7·1	7·1	23	7·77
		Dec.		29·698	1·234	55·0	11·8	43·2	38·9	32·4	30·5	30·5	2·0	·171	0·1	92	558	—	—	0·8	9	5	7	10	4·3	5·9	18	2·03
NORWICH (Norfolk), John Quilter, Esq., Jun.	42	Oct.		29·706	1·346	68·0	30·0	38·0	47·5	51·3	47·7	47·8	3·7	·332	0·5	88	538	—	—	—	0	5	14	12	—	—	15	1·68
		Nov.		29·656	1·340	61·0	24·0	37·0	44·8	40·8	39·0	38·4	3·2	·284	0·2	94	549	—	—	—	6	4	14	4	—	—	22	4·97
		Dec.		29·644	0·978	54·0	16·0	38·0	37·0	32·8	30·7	30·7	1·9	·173	0·2	92	558	—	—	—	4	4	10	15	—	—	13	1·47
WROTTESLEY, WOLVERHAMPTON (Stafford), E. Stephen, Esq.	600	Oct.		29·178	1·276	68·5	29·4	39·1	48·5	48·7	45·5	45·5	3·4	·290	0·5	89	531	—	—	—	4	7	15	5	7·0	7·3	15	3·10
		Nov.		29·096	1·130	60·0	26·4	33·6	41·7	39·1	33·1	33·1	2·2	·180	0·3	89	547	—	—	—	11	3	5	11	7·3	8·1	11	2·89
		Dec.		29·152	1·128	49·8	10·6	39·2	35·2	25·1	26·8	26·8	1·7	·145	0·4	85	552	—	—	—	10	6	12	12	6·4	8·1	15	1·95
LEICESTER (Town Museum), W. J. Harrison, Esq., F.G.S.	238	Oct.		29·478	1·240	71·0	31·2	40·7	50·0	49·7	45·2	45·2	3·5	·309	0·6	85	536	85·7	29·4	0·7	5	5	11	10	6·4	8·8	20	2·53
		Nov.		29·489	1·280	59·4	28·5	30·9	43·8	38·7	33·8	33·8	2·3	·193	0·5	84	549	60·2	29·4	0·5	13	6	3	8	8·8	8·8	19	3·29
		Dec.		29·459	1·244	52·5	6·9	45·6	36·3	29·3	29·2	29·2	1·8	·154	0·3	83	555	46·3	29·4	0·4	7	6	9	9	6·5	8·5	15	1·75
NOTTINGHAM (Notts), M. O. Talbotton, Esq., C.E., F.G.S., F.M.S.	183	Oct.		29·624	1·311	71·0	27·0	44·0	52·3	49·3	46·2	46·2	3·6	·314	0·4	90	537	81·4	29·8	0·3	5	5	13	8	6·2	6·8	25	2·93
		Nov.		29·540	1·240	63·4	25·2	37·2	47·2	43·0	37·6	37·6	2·4	·231	0·3	91	551	60·5	29·8	0·3	15	4	7	7	6·9	6·9	25	2·13
		Dec.		29·481	1·295	50·2	5·2	45·0	34·5	24·5	27·7	27·6	1·8	·151	0·5	90	559	43·3	29·5	0·2	11	5	5	10	7·1	7·1	18	2·00
LLANDUDNO (Carnarvonshire), James Nicol, Esq., M.D., and Thomas Dalton, Esq., M.D.	100	Oct.		29·562	1·339	73·0	30·0	43·0	52·0	51·0	45·8	45·8	3·5	·308	1·0	78	534	—	—	1·1	8	2	9	5	6·0	6·0	17	3·02
		Nov.		29·607	1·240	59·8	21·4	38·4	43·8	41·7	37·1	37·1	2·4	·205	0·7	79	549	—	—	1·3	13	4	6	7	6·7	7·6	16	3·32
		Dec.		29·693	1·270	53·0	20·7	32·3	40·2	31·1	30·0	30·0	2·0	·175	0·5	82	554	—	—	1·0	10	6	5	10	5·6	5·6	19	1·96
KELSTERN GRANGE, near Louth (Lincolnshire), D. Grant Bates, Esq., F.M.S.	205	Oct.		29·583	1·312	66·7	29·4	37·3	45·4	46·6	44·1	44·1	3·3	·298	0·5	87	533	93·4	29·6	1·3	4	6	12	9	6·8	6·9	17	2·37
		Nov.		29·538	1·430	57·6	30·9	26·7	44·5	39·4	34·0	33·9	2·3	·196	0·3	91	547	60·8	29·8	1·0	11	3	4	12	6·3	6·9	23	6·49
		Dec.		29·250	1·537	50·8	11·8	39·0	34·4	25·5	25·0	25·0	1·6	·136	0·3	86	555	43·9	29·6	0·8	10	5	6	12	4·0	5·5	20	2·03
LIVERPOOL OBSERVATORY, John Hartnup, Esq., F.R.A.S.	197	Oct.		29·473	1·365	68·1	28·9	39·2	46·8	46·3	46·3	46·3	3·6	·315	0·6	86	535	—	—	1·2	3	9	10	9	7·1	7·1	21	2·46
		Nov.		29·680	1·316	59·0	29·2	29·8	43·3	39·2	35·1	35·1	2·4	·205	0·5	86	550	—	—	1·0	13	5	5	7	6·3	6·3	13	1·52
		Dec.		29·478	1·360	51·4	12·7	38·7	37·8	34·0	30·7	30·7	2·0	·172	0·3	87	554	—	—	0·9	8	5	6	12	5·5	6·5	15	1·96
ECCLES (near Manchester), Rev. T. Mackereth, F.M.S., F.R.A.S.	145	Oct.		29·559	1·314	70·3	23·2	42·3	47·5	49·6	44·2	44·2	3·5	·290	0·7	82	537	93·7	29·5	0·5	4	7	13	7	7·5	7·5	21	3·90
SHARPLES, BOLTON (Lancashire), Rev. T. Mackereth, F.R.A.S., F.M.S.	481	Dec.		29·175	1·270	50·0	7·4	42·6	32·8	21·8	14·0	25·3	1·7	·156	0·3	82	553	66·7	29·1	0·2	11	4	3	13	3·5	7·1	15	3·11
BERMERSIDE OBSERVATORY, HALIFAX (Yorkshire), E. J. Crossley, Esq., F.R.A.S.	320	Oct.		29·146	1·290	70·8	28·0	42·8	53·9	44·0	11·9	45·2	3·5	·302	0·5	85	530	85·3	40·1	0·7	3	7	10	11	—	7·4	15	3·61
		Nov.		29·222	1·245	63·4	28·5	19·0	42·3	39·6	9·7	36·8	3·1	·179	0·5	83	546	65·0	29·3	0·4	11	3	2	14	—	6·4	9	2·91
		Dec.		29·135	1·290	49·8	12·0	37·8	35·8	31·3	25·6	25·6	1·7	·128	0·5	79	550	57·6	29·0	0·5	8	4	4	13	—	6·5	9	3·50
HULL (Yorkshire), Mr. E. Peake.	12	Oct.		29·693	1·588	67·0	29·0	38·0	46·5	49·0	46·7	46·7	3·6	·319	0·5	89	539	73·3	41·3	—	—	—	—	—	1·9	—	19	4·65
		Nov.		29·661	1·464	60·0	24·0	36·0	43·7	39·3	35·4	35·4	2·3	·205	0·4	86	553	59·7	30·3	—	—	—	—	—	1·7	—	25	4·47
		Dec.		29·665	1·348	51·0	9·0	42·0	35·3	24·2	24·2	24·2	1·6	·146	0·4	85	561	44·1	29·6	—	—	—	—	—	0·0	—	23	2·47
STONYHURST (Lancashire), Rev. S. J. Perry, F.R.S., F.M.S., F.R.A.S.	333	Oct.		29·291	1·378	69·2	27·6	41·6	50·0	49·4	44·8	44·8	3·4	·298	0·6	85	533	98·5	41·3	1·6	3	5	14	9	—	—	24	5·42
		Nov.		29·308	1·354	59·0	25·8	34·2	43·4	38·0	10·4	37·5	3·1	·195	0·5	83	548	78·6	29·8	1·0	14	1	5	11	—	—	17	3·77
		Dec.		29·275	1·346	50·5	13·1	37·4	34·8	29·3	12·0	29·3	1·6	·134	0·4	79	554	64·0	29·4	0·9	13	3	3	13	—	—	16	2·03
LEEDS (Philosophical Hall) (Yorkshire), H. Crowther, Esq.	337	Oct.		29·548	1·316	68·0	31·0	37·0	46·5	51·2	46·3	46·3	3·4	·297	0·9	79	535	93·9	29·6	1·7	5	6	11	8	—	—	20	2·45
		Nov.		29·623	1·296	61·0	25·0	36·0	44·2	39·8	10·4	39·8	2·9	·191	0·6	80	550	62·9	29·8	1·7	12	2	3	13	—	—	19	3·11
		Dec.		29·545	1·310	55·0	14·0	41·0	38·2	32·9	10·4	32·9	1·8	·151	0·5	77	555	49·9	29·7	1·6	9	3	3	16	—	—	17	1·41

Names of Stations and Observers.	Height of Station above Sea Level.	Year 1878. Months.	Pressure of Atmosphere in Month. Mean.	Pressure of Atmosphere in Month. Range.	Temperature of Air in Month. Highest.	Temperature of Air in Month. Lowest.	Temperature of Air in Month. Range.	Temperature of Air in Month. Mean of all Highest.	Temperature of Air in Month. Mean of all Lowest.	Temperature of Air in Month. Mean Daily Range.	Mean Temperature. Air.	Mean Temperature. Dew Point.	Vapour. Elastic Force.	Vapour. In a cubic foot of Air. Mean.	Vapour. In a cubic foot of Air. Mean Short of Saturation.	Mean Degree of Humidity. Satr. = 100.	Mean Weight of a cubic foot of Air.	Mean Reading of Thermometer. Maximum in Rays of Sun.	Mean Reading of Thermometer. Minimum on Grass.	Wind. Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Rain. Number of Days it fell.	Rain. Amount collected.
	feet.		in.	in.	°	°	°	°	°	°	°	°	in.	grs.	gr.		grs.	°	°									in.
BRADFORD (Yorkshire), J. McLANDSBOROUGH, Esq., C.E., F.G.S.	366	Oct.	29·290	1·298	67·0	32·8	34·2	55·2	45·4	9·8	49·5	45·3	·304	3·5	0·5	86	533	63·7	—	1·2	8	5	8	10	—	7·3	21	3·16
		Nov.	29·366	1·220	47·4	29·0	18·4	42·4	34·2	8·2	38·0	33·5	·192	2·2	0·5	84	547	52·1	—	1·3	14	4	3	9	—	6·7	17	2·63
		Dec.	29·302	1·310	49·4	18·9	35·5	35·8	27·3	8·5	32·4	28·0	·153	1·8	0·3	84	552	42·7	—	1·1	17	4	2	8	—	6·8	14	1·78
COCKERMOUTH (Cumberland), H. DODGSON, Esq., M.D., F.R.A.S., F.M.S.	146	Oct.	29·493	1·432	70·0	32·3	37·7	56·6	45·9	10·7	50·4	44·8	·298	3·5	0·7	92	536	85·5	36·8	0·3	5	5	12	9	2·0	7·0	20	4·92
		Nov.	29·639	1·120	47·7	23·0	24·7	43·8	32·3	10·5	37·0	33·4	·191	2·2	0·4	87	553	55·2	26·7	0·2	14	5	4	7	1·2	6·3	6	2·03
		Dec.	29·532	1·330	48·0	6·1	41·9	34·4	22·0	12·4	28·1	23·6	·126	1·5	0·5	83	561	38·8	17·6	0·3	8	8	4	11	1·0	4·6	13	2·17
ALLENHEADS (Northumberland), MR. JOSEPH CHARLTON, Assistant to W. B. BEAUMONT, Esq., M.P.	1360	Oct.	28·213	1·286	—	25·3	—	—	38·9	—	—	—	—	—	—	—	—	76·6	—	1·2	—	—	—	—	—	6·2	19	4·49
		Nov.	28·397	1·073	—	10·6	—	—	28·4	—	—	—	—	—	—	—	—	61·4	—	0·5	—	—	—	—	—	7·5	18	5·91
		Dec.	28·200	1·339	—	8·0	—	—	20·0	—	—	—	—	—	—	—	—	55·1	—	0·2	—	—	—	—	—	7·3	21	5·65
SILLOTH RECTORY (Cumberland), REV. FRANCIS REDFORD, M.A., F.R.A.S., F.M.S.	28	Oct.	29·697	1·454	74·7	31·0	43·7	59·0	44·3	14·7	50·8	45·1	·300	3·4	0·8	81	537	88·2	38·1	1·4	4	5	7	15	7·9	5·5	15	2·20
		Nov.	29·737	1·267	59·6	24·4	35·2	44·8	31·7	13·1	37·7	34·0	·175	2·0	0·8	78	545	67·1	29·1	1·0	9	7	6	8	6·6	5·1	8	1·58
		Dec.	29·629	1·346	48·5	9·4	39·1	35·3	21·8	13·5	28·6	21·5	·116	1·4	0·4	74	563	53·8	17·9	1·1	10	5	4	12	7·3	4·4	12	2·56
CARLISLE (Cumberland), ISAAC CARTMELL, Esq., F.M.S.	114	Oct.	29·508	1·386	70·7	25·3	45·4	58·9	42·0	14·9	49·4	44·4	·293	3·4	0·7	84	537	81·2	36·6	1·6	4	5	13	9	6·2	6·7	17	3·19
		Nov.	29·668	1·294	48·3	22·9	25·4	42·9	30·6	12·3	36·8	34·5	·200	2·4	0·2	92	554	50·3	25·8	0·8	12	5	4	9	4·5	6·5	17	1·64
		Dec.	29·583	1·406	51·0	5·0	46·0	34·3	19·5	14·8	26·8	22·7	·129	1·5	0·2	84	564	42·2	14·0	0·9	9	5	3	14	2·7	6·5	8	1·52
BYWELL (Northumberland), MR. JOHN DAWSON, Assistant to W. B. BEAUMONT, Esq., M.P.	87	Oct.	29·518	1·326	67·0	32·0	34·6	56·7	45·4	11·3	50·0	43·8	·286	3·3	0·6	80	536	72·7	29·2	1·2	5	6	8	12	—	5·3	15	1·58
		Nov.	29·627	1·334	48·0	27·0	19·0	43·3	34·8	8·5	38·4	32·8	·186	2·2	0·6	81	551	54·8	28·5	1·2	11	5	3	11	—	7·0	25	5·99
		Dec.	29·525	1·436	53·0	7·0	46·0	31·8	21·5	10·3	29·9	26·2	·142	1·7	0·3	85	559	43·2	18·7	1·1	5	5	7	14	—	7·0	24	3·02
NORTH SHIELDS (Northumberland), ROBERT SPENCE, Esq.	124	Oct.	29·591	1·338	64·0	29·3	34·7	54·7	44·7	10·0	48·9	44·4	·294	3·3	0·6	85	539	—	43·1	1·6	6	3	8	14	—	5·7	17	1·50
		Nov.	29·694	1·253	48·0	26·0	23·0	45·1	34·1	9·0	38·4	35·1	·204	2·4	0·4	88	555	—	33·2	1·9	13	8	2	7	—	6·8	26	6·40
		Dec.	29·578	1·500	48·5	9·0	39·5	34·6	25·5	9·1	30·2	27·0	·147	1·8	0·3	87	560	—	24·8	1·3	13	3	3	12	—	6·7	23	4·82
WARINGSTOWN, CO. DOWN (Ireland), THOMAS WARING, Esq.	191	Oct.	29·587	1·322	68·0	28·0	40·0	57·3	44·3	13·0	49·8	46·9	·322	3·7	0·4	90	534	79·4	40·9	2·9	6	2	12	11	—	5·2	21	3·47
		Nov.	29·593	1·159	51·0	21·0	30·0	43·9	30·6	13·4	36·9	33·6	·193	2·3	0·3	88	542	50·4	28·1	2·2	14	3	3	10	—	4·3	21	1·84
		Dec.	29·469	1·280	50·0	5·0	45·0	37·0	21·8	15·2	30·0	25·9	·140	1·7	0·3	83	558	45·1	—	2·2	14	5	3	9	—	4·8	21	1·86

Second Rain-gauges are placed—

			October.		November.		December.		Total in Quarter.
At Strathfield Turgiss, at the height of 38 feet *above the ground*, the amount collected was			1·93 inches.	–	2·33 inches.	–	1·06 inches.	–	5·32 inches.
,, Oxford,	,,	22 feet ,, ,,	3·04 ,,	–	2·38 ,,	–	1·44 ,,	–	6·86 ,,
,, Cardington,	,,	36 feet ,, ,,	1·90 ,,	–	2·84 ,,	–	1·20 ,,	–	5·94 ,,
,, Eccles,	,,	34 feet ,, ,,	3·27 ,,	–	–	–	–	–	–
,, Nottingham,	,,	39 feet ,, ,,	2·71 ,,	–	2·20 ,,	–	1·98 ,,	–	6·89 ,,

NOTE.—*Barometer Reading*, LEEDS, 14th October, 10h. a.m., 30·502 inches, has been altered to 30·002 inches.

,, COCKERMOUTH, 21st ,, 9h. p.m., 29·940 ,, ,, 29·640 ,,

,, STOCKTON RECTORY, [illegible] ,, [illegible] ,, ,, [illegible] ,,

,, PLYMOUTH, 12th November, 9h. a.m., 29·448 ,, ,, [illegible] ,,

NAMES OF STATIONS.	Mean Pressure of dry Air reduced to the level of the Sea.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Range of Temperature for Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Mean Number of Days on which it fell.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		cubic.	°								
Guernsey	29·531	66·0	28·0	38·0	50·7	42·4	23·8	8·3	43·5	41·6	·270	3·1	0·6	83	541	—	1·7	9	7	6	9	3·8	6·3	69
Helston	29·572	72·0	24·0	52·0	53·1	41·4	32·0	10·7	45·7	40·5	·254	2·9	0·6	79	543	61·3	1·6	11	8	5	7	3·7	4·5	58
Truro	29·551	69·0	11·0	58·0	50·5	36·8	30·0	12·7	41·6	39·0	·255	3·0	0·4	84	547	—	1·7	11	6	5	7	3·7	6·2	72
Plymouth	29·561	68·0	19·0	49·0	49·4	37·5	30·2	11·9	44·4	41·4	·264	3·0	0·5	87	549	—	1·6	11	6	5	7	3·7	6·3	72
Torquay	29·561	69·0	26·0	43·0	49·8	40·3	29·5	11·2	44·4	40·1	·254	2·9	0·4	84	542	59·5	1·6	10	5	5	11	3·8	6·3	72
Penzance	29·572	73·8	24·1	49·7	51·5	41·2	29·7	10·0	46·3	43·5	·286	3·3	0·6	83	545	—	—	10	8	4	8	3·7	5·1	72
Debenne	29·546	67·4	24·7	42·7	48·9	37·6	31·5	12·8	42·8	39·5	·252	2·9	0·6	83	543	60·9	—	9	7	5	11	—	7·0	68
Bournemouth	29·584	68·9	32·1	42·8	47·6	37·6	27·5	10·0	42·4	37·1	·243	2·7	0·4	84	547	—	—	9	7	4	11	—	5·4	58
Salisbury	—	—	16·0	—	—	25·1	—	—	—	—	—	—	—	82	—	72·4	1·5	9	7	5	10	—	6·9	61
Barnstaple	29·555	72·0	14·0	58·0	50·1	35·5	27·5	11·5	41·0	38·1	·247	2·9	0·5	87	547	—	1·5	10	4	7	9	4·1	5·3	73
Bath	29·555	70·0	14·8	53·1	49·4	35·6	27·0	10·6	42·6	39·6	·260	3·1	0·6	84	546	—	1·7	9	5	6	11	—	6·4	65
Cate Howe	29·551	67·0	19·0	48·0	49·4	38·7	29·7	10·7	43·6	40·6	·256	3·0	0·5	84	545	—	1·8	11	5	6	10	—	6·5	66
Ramsgate	29·549	67·0	19·1	47·9	47·4	38·7	29·6	8·7	43·1	40·5	·256	3·0	0·5	86	545	—	1·6	8	4	6	12	—	6·1	62
Strathfield Turgiss	29·542	71·0	9·0	62·0	47·2	34·7	28·5	12·5	41·0	37·4	·242	2·7	0·5	83	547	—	1·6	8	4	7	12	—	6·1	62
Weybridge	29·542	75·0	9·0	66·0	46·7	34·8	29·0	11·9	40·7	37·1	·243	2·7	0·5	83	549	61·4	1·6	9	5	5	11	—	6·7	58
Marlborough	29·541	72·6	14·0	58·6	48·5	31·8	27·1	11·7	40·1	37·0	·242	2·8	0·4	84	542	72·1	1·7	11	4	6	10	—	6·9	65
Blackheath	29·553	74·0	15·9	58·1	48·9	34·5	28·4	10·4	41·7	37·9	·252	2·9	0·5	85	547	71·4	1·7	8	7	6	9	—	7·8	61
Streatley	—	73·9	16·2	57·7	—	—	29·2	—	—	—	—	—	—	84	—	—	—	—	—	—	—	—	—	62
Camden Square	29·551	73·0	18·7	54·0	47·5	36·5	28·1	11·0	41·8	37·8	·248	2·8	0·5	84	547	69·5	1·6	9	5	6	10	3·7	7·0	65
Oxford	29·551	70·0	17·6	54·4	46·2	33·6	29·0	12·4	40·1	37·1	·243	2·8	0·5	86	551	73·3	1·6	9	5	6	10	3·7	7·9	61
Royston	29·541	70·0	13·2	56·8	48·1	34·0	28·2	12·1	40·9	36·0	·217	2·5	0·5	83	547	—	—	8	5	7	11	—	6·9	61
Cardington	29·540	70·6	12·0	58·6	49·1	34·1	29·6	11·6	40·5	36·5	·232	2·7	0·5	82	550	70·6	1·5	10	4	6	10	—	6·9	63
Cambridge	29·548	73·8	12·5	61·3	46·8	33·4	29·1	11·4	40·1	36·1	·236	2·8	0·5	86	547	70·6	1·6	9	4	7	10	—	6·5	62
Stockton	29·545	72·5	5·0	67·5	45·9	34·6	28·8	12·0	40·1	37·0	·246	2·9	0·5	86	545	69·5	1·5	9	4	6	12	3·7	6·2	65
Lowestoft	29·537	68·8	15·8	49·0	46·8	37·1	32·0	9·7	41·9	37·2	·246	2·9	0·5	83	547	71·5	1·6	9	5	5	14	3·8	7·5	55
Somersby	29·474	64·9	11·8	57·1	45·7	33·5	27·0	12·2	41·5	39·2	·249	2·9	0·5	92	548	—	—	8	5	7	9	3·9	6·1	56
Norwich	29·489	68·0	16·0	52·0	46·4	33·2	29·0	9·2	41·6	39·1	·247	2·9	0·5	91	545	—	—	3	4	9	11	—	—	59
Wolverhampton	29·522	68·5	16·6	57·9	44·1	33·4	31·6	10·7	38·9	35·1	·224	2·8	0·5	88	543	—	—	4	4	7	11	—	7·8	61
Leicester	29·532	71·2	6·9	57·0	45·0	33·2	31·7	9·5	40·1	35·7	·217	2·6	0·5	85	547	65·3	1·5	8	6	7	9	—	7·9	54
Nottingham	29·498	71·0	3·2	67·8	43·4	33·5	27·0	12·1	40·2	37·5	·228	2·8	0·5	91	549	63·1	1·7	10	5	7	8	1·4	6·9	65
Llandudno	29·582	74·0	20·7	53·3	48·4	38·0	29·9	9·6	43·4	37·1	·229	2·7	0·5	85	546	—	1·1	9	4	7	11	—	6·1	82
Colstera Grange	29·561	69·7	11·8	54·9	49·7	38·0	31·7	10·7	43·0	39·2	·254	2·9	0·5	84	544	77·2	1·6	8	4	7	11	3·4	6·0	69
Liverpool	29·544	67·1	12·7	54·4	45·7	37·6	28·5	8·1	41·5	37·4	·233	2·6	0·5	84	544	—	1·6	8	6	7	9	—	6·6	42
Bermerside	29·555	70·8	12·0	58·8	44·7	34·1	29·5	10·3	40·0	36·4	·232	2·7	0·5	86	542	69·9	0·8	7	5	5	13	—	6·8	33
Hull	29·472	67·0	9·0	58·0	41·8	31·0	27·0	10·8	39·7	37·2	·242	2·8	0·5	87	551	56·1	3·4	—	—	—	—	1·2	—	65
Stonyhurst	29·509	69·2	13·1	57·1	45·4	33·8	31·3	11·6	39·3	34·0	·201	2·4	0·5	82	545	70·7	90·7	1·2	10	3	7	11	—	8·2	57
Leeds	29·505	68·0	14·0	54·0	47·6	35·1	31·3	12·5	41·5	37·2	·243	2·8	0·5	85	547	52·6	—	1·7	9	4	5	11	—	6·4	53
Bradford	29·495	67·0	13·9	53·1	44·5	33·6	29·4	9·8	41·0	37·5	·246	2·9	0·5	85	544	52·8	—	1·2	13	4	4	9	—	6·9	52
Cockermouth	29·503	70·0	6·1	63·9	44·6	33·4	31·6	11·2	38·7	34·9	·205	2·4	0·4	84	550	59·8	57·0	0·8	9	5	7	8	1·4	6·0	79
Allenheads	—	—	8·0	—	—	29·1	—	—	—	—	—	—	—	1	—	64·4	—	0·6	—	—	—	—	—	7·0	58
Silloth	29·494	74·7	9·4	65·3	46·4	32·6	31·3	13·8	39·6	32·5	·197	2·3	0·7	78	552	69·7	24·0	1·2	8	6	5	11	7·1	5·0	35
Carlisle	29·505	70·7	5·0	65·7	44·7	30·7	28·9	14·0	37·7	33·9	·204	2·4	0·6	87	552	59·9	35·5	1·1	8	5	7	11	4·5	6·6	42
Bywell	29·445	67·0	7·0	60·0	44·9	34·9	33·0	10·0	40·4	36·3	·235	2·8	0·5	82	549	56·9	29·8	1·2	7	5	6	12	—	6·4	64
North Shields	—	64·0	9·0	55·0	44·1	31·8	32·1	9·3	39·2	35·8	·215	2·5	0·5	87	551	—	43·7	1·6	11	5	4	11	—	6·4	68
Waringstown (Irel.)	29·474	68·0	5·0	63·0	46·1	32·2	38·3	13·9	38·9	37·3	·216	2·5	0·5	87	548	61·3	1	2·4	11	3	6	10	—	4·8	68

The highest temperatures of the air were at Streatley, 76°·9; Weybridge, 75°·0; Silloth, 74°·7; and Strathfield and Blackheath, 74°·0.

The lowest temperatures of the air were at Stockton, Carlisle, and Waringstown, all, 5°·0; Nottingham, 5°·2; Oxford, 5°·6; Cockermouth, 6°·1, and Streatley 6°·2.

The greatest daily ranges of the temperatures of the air were at Carlisle, 14°·0; Waringstown, 13°·9; Silloth, 13°·8; and Helston 13°·6.

The least daily ranges of the temperatures of the air were at Liverpool, 8°·1; Guernsey, 8°·3; Ramsgate, 8°·7; and Bradford 8

The greatest number of rainy days were at Guernsey, 69; Nottingham and North Shields, both 66; Hull, 65; and Bywell 64.

The least number of rainy days were at Bermerside, 33; Silloth, 35; Bournemouth, 38; and Cockermouth 39.

The heaviest falls of rain were at Guernsey, 18·13 inches; Truro, 17·23 inches; Allenheads, 15·45 inches; and Helston 14·17 inches

The least falls of rain were at Bournemouth 5·32 inches; Liverpool, 5·94 inches; Carlisle, 6·33 inches, and Camden Square, 6·41 inches

Quarterly Meteorological Table for different Parallels of Latitude.

PARALLELS OF LATITUDE, &c.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean of all Highest Readings of the Thermometer.	Mean of all Lowest Readings of the Thermometer.	Mean Range of Temperature for Quarter.	Mean of all Highest.	Mean of all Lowest.	Mean Monthly Range of Temperature.	Mean Daily Range of Temperature.	Mean Temperature of the Air.	Mean Temperature of the Dew Point.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required for saturation.	Mean degree of Humidity.	Mean Weight of a cubic foot of Air.	Mean Reading of Maximum in Rays of Sun.	Wind. Mean Estimated Strength.	Wind. Relative Proportion of N.	Wind. Relative Proportion of E.	Wind. Relative Proportion of S.	Wind. Relative Proportion of W.	Mean Amount of Ozone.	Mean Amount of Cloud.	Mean Number of Days it fell.
	in.	°	°	°	°	°	°	°	°	°	in.	grs.	gr.		cubic.	°								
Guernsey	29·500	65·0	23·0	43·0	50·7	42·4	23·8	8·3	43·5	41·6	·270	3·1	0·6	83	541	—	1·7	9			9	3·8	6·3	69
Between the latitudes 50° and 51°	29·556	69·0	23·1	48·9	49·9	38·5	31·4	11·4	43·8	39·5	·249	2·9	0·6	85	545	74·1	33·7	1·4	10		5		5·0	5·9	51
Between the latitudes 51° and 52°	29·536	72·0	13·2	58·8	48·9	33·1	31·9	10·5	41·4	37·7	·233	2·7	0·4	87	545	70·7	31·0	1·5	10		6	10	1·4	6·5	44
Between the latitudes 52° and 53°	29·493	70·0	10·9	59·1	44·0	31·4	33·5	11·1	40·4	37·2	·240	2·6	0·4	87	547	62·8	29·5	0·7	8	5	7	11	4·7	6·9	50
Between the latitudes 53° and 54°	29·501	68·3	13·4	54·9	45·6	35·5	32·4	10·3	40·2	35·6	·217	2·5	0·5	84	544	64·7	30·4	1·1	9	4	6	11	1·3	6·4	55
Between the latitudes 54° and 55°	29·485	70·6	6·9	63·7	45·1	32·9	35·8	12·2	38·7	33·7	·203	2·4	0·6	83	551	62·1	27·3	0·9	8	5	7	11	4·4	6·2	49
Mean for the Quarter, 50° to 55° — Year 1875	29·537	69·4	22·6	47·8	48·5	38·5	32·3	10·0	43·2	39·5	·246	2·8	0·5	87	547	69·0	34·3	1·2	7	8	7	9	3·7	7·4	54
Mean for the Quarter, 50° to 55° — " 1876	29·451	67·5	24·9	44·0	51·0	41·8	31·1	10·1	46·5	42·8	·278	3·2	0·5	87	541	66·6	37·0	1·1	5	8	10		3·5	7·1	55
Mean for the Quarter, 50° to 55° — " 1877	29·504	68·7	27·2	43·5	51·0	43·5	30·5	12·1	45·4	41·6	·259	3·0	0·5	85	545	71·7	33·9	1·3	5	8	9	13	4·1	6·6	58
Mean for the Quarter, 50° to 55° — " 1878	29·513	70·0	12·9	57·1	46·7	35·5	31·9	11·2	40·9	36·7	·227	2·6	0·5	86	547	64·9	39·6	1·1	9	5	6	10	3·8	6·4	49

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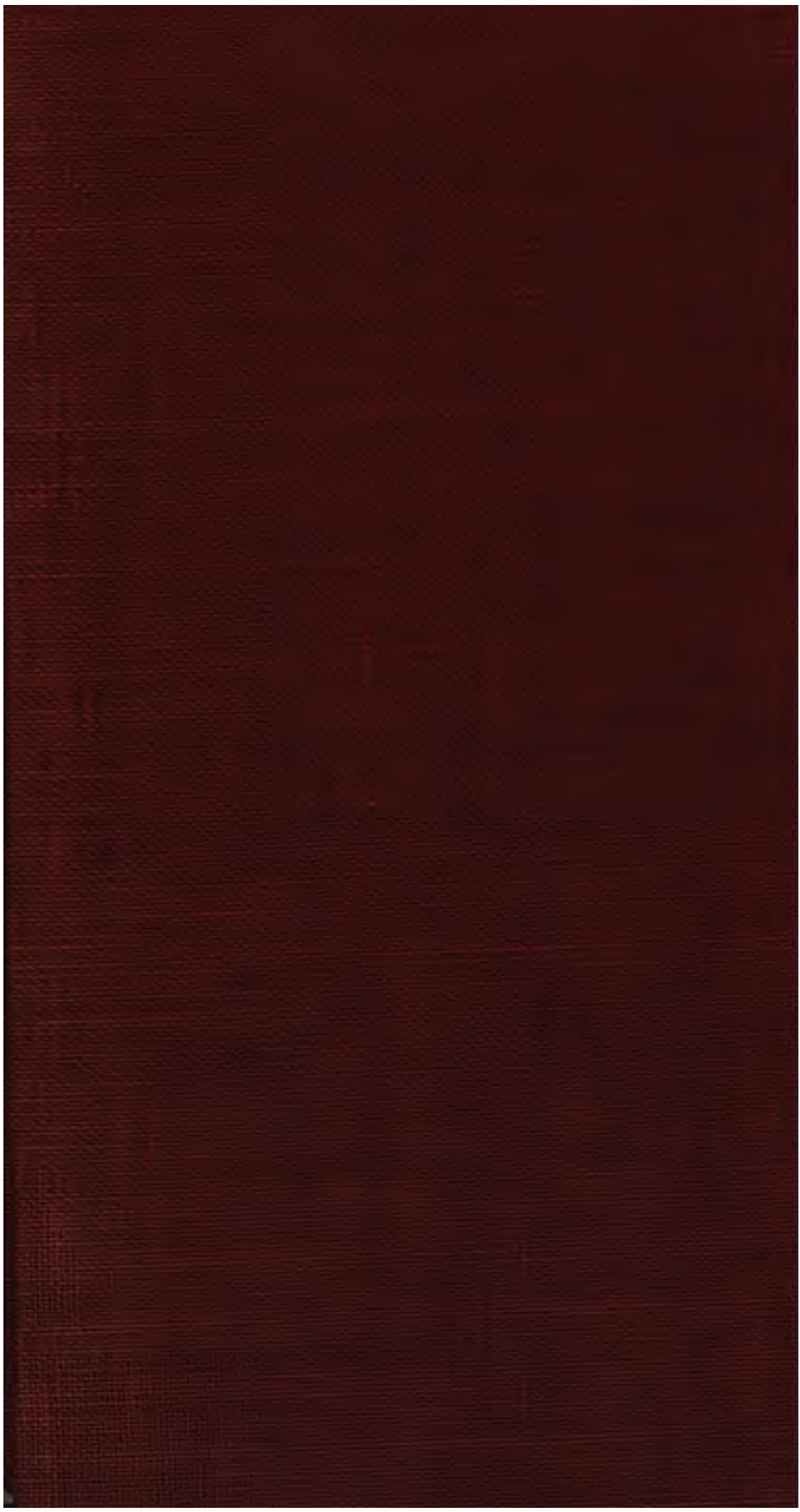
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